



# THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XXVII. No. 10.

JANUARY, 1921.

## NOTES FOR THE MONTH.

THE Ministry of Agriculture and Fisheries Act provides for the setting up of an Agricultural Council for England and a similar Council for Wales, together with an Agricultural Advisory Committee for England and Wales.

### **First Meeting of the Agricultural Council for England.**

The Agricultural Council for England has now been constituted and in accordance with the Act, is composed of members appointed by the Minister, by the Agricultural Wages Board, by County Agricultural Committees and by Agricultural Committees of County Boroughs. The members appointed by the Minister include representatives of workmen engaged in agriculture, owners of agricultural land, tenants of agricultural land, women, representatives of the industry of Horticulture, and representatives of agricultural education and research. The members appointed by the Agricultural Wages Board include both representatives of employers and representatives of workers.

The first meeting of the Agricultural Council for England was held at Essex Hall, London, on the 9th December last. The Earl of Selborne, K.G., G.C.M.G., was elected Chairman. The Right Hon. The Lord Lee of Fareham, Minister of Agriculture and Fisheries, delivered an inaugural address, the text of which will be found at p. 912 of this *Journal*.

The Council then proceeded to elect members to serve on the Agricultural Advisory Committee for England and Wales. The Ministry of Agriculture and Fisheries Act provides that the members of the Council appointed by the Minister shall nominate five of their number as members of the Agricultural Advisory Committee of whom one shall be an owner, one a tenant of agricultural land, one a representative of workmen engaged in agriculture, one a woman, and one a representative of agricultural

education or research. The representatives of these interests elected to the Advisory Committee in the order named, were Lord Selborne, Mr. Henry Overman, C.B.E., Mr. George Edwards, M.P., Lady Mabel Smith, and Professor T. B. Wood, C.B.E., M.A., F.R.S.

The members of the Council representing the County Agricultural Committees elected the following gentlemen to the Advisory Committee:—The Right Hon Sir Ailwyn E. Fellowes, K.B.E., K.C.V.O., Mr. E. W. Langford, Alderman G. G. Rea, C.B.E., Lord Bledisloe, K.B.E., and Sir Douglas Newton, K.B.E. It was announced that the Minister proposed to appoint Mr. R. R. Robbins, C.B.E., as a representative of employers and Mr. W. R. Smith, M.P., as a representative of workers on the Agricultural Advisory Committee and Mr. Henry Overman, C.B.E., as Vice-Chairman of the Committee.

The object of the Advisory Committee is to advise the Minister with respect to all questions submitted to the Committee in relation to the exercise by the Minister of any powers or duties which do not relate to the industry of fishing. The Advisory Committee will be at liberty to make recommendations with regard to other matters affecting Village and Rural Industries.

\* \* \* \* \*

THE first meeting of the Advisory Committee above referred to was held on Tuesday, December 14th. This meeting was

**Meeting of the  
Agricultural Advisory  
Committee.**

specially convened to consider the low prices at present being realised by farmers for British wheat. The chair was taken by Lord Lee of Fareham, and the following members of the Advisory Committee were present:—Mr. Henry Overman, Mr. E. W. Langford, Mr. George Edwards, M.P., Lord Bledisloe, Professor T. B. Wood, Sir Douglas Newton, and Sir Ailwyn E. Fellowes.

The Committee represented to the Minister the difficulty which was at present being experienced by farmers in obtaining a market for their wheat, and they urged that all possible steps should be taken which would be likely to stimulate the demand for home-grown wheat. Various proposals were put forward and the Minister explained the steps which had already been taken in regard to the matter. The principal points which arose in the course of the discussion are given in the following correspondence which subsequently passed between the National Farmers' Union and the Ministry.

\* \* \* \* \*

THE following letter, dated 15th December, 1920, was addressed by the National Farmers' Union to the Minister of Agriculture:—

**Correspondence  
with the National  
Farmers' Union as  
to Prices of Home-  
Grown Wheat.**

My Lord,—At a meeting of the Council of the National Farmers' Union held this day, by the courtesy of the Royal Agricultural Society of England, at No. 16, Bedford Square, W.C.1, the following resolution was unanimously passed:—

“ The National Farmers' Union beg to call the attention of the Minister of Agriculture and the Food Controller to the difficult position in which farmers find themselves in disposing of their wheats.

“ On March 11th last, the Prime Minister announced in the House of Commons that the Government had decided that so long as wheat was controlled and thereby deprived of a free market the controlled price of home-grown wheat of sound milling quality should be the monthly average c.i.f. price of imported wheat, provided that the price so paid should not exceed 95s. per quarter of 504 lb.

“ Up to this date, the average monthly price of imported wheat, according to the purchases of the Wheat Commission, have exceeded 102s. per quarter of 480 lb., and the time has not, therefore, arrived when the British farmer should be required to take less than 95s. per quarter for his sound milling wheats; yet on Mark Lane on Monday last, prominent millers were quoting 80s. for the choicest samples of native wheats.

“ Farmers who have threshed their wheats have done so in reliance upon the announcement of the Ministry of Food, published on the 18th September last, informing them that they had nothing to gain by holding them.

“ There is no immediate prospect that the position will improve. On the contrary, there is the danger that it will grow worse.

“ With a view, therefore, to assisting the farmer to obtain the price which he has been led to expect, the National Farmers' Union make the following proposals:—

“ 1. That millers should be required for a period of one month to use an admixture of 20 per cent. of English wheat.

“ 2. That the percentage of extraction should be again lowered so as to encourage the use of native wheats.

" 3. That the free export of wheat for the continent be permitted.

" 4. That millers making flour from native wheat should be permitted to sell the flour at a price lower than the flat rate prescribed by the Food Controller.

" 5. That the Cereals (Restriction) Order, 1919, be withdrawn so that farmers unable, in spite of the above concessions, to market their produce may feed to stock as in pre-war days.

" The National Farmers' Union respectfully record their opinion that if the functions of the Wheat Commission as now exercised in relation to mills were discontinued, farmers would, under the influence of free conditions, have little difficulty in obtaining readily the assured maximum price of 95s. until such time as the reduction in the cost of imported grain compelled them to take less."

I am, &c.,

(Sgd.) A. D. ALLEN,

General Secretary.

The Right Hon. The Lord Lee of Fareham.

The following is a copy of the Ministry's reply :—

17th December, 1920.

Sir,—I am directed to refer to your letter of the 15th inst., forwarding a resolution passed by the National Farmers' Union with reference to the price of wheat and to say that the Minister has already given careful consideration to the question of the prices now being realised for British wheat and has taken steps in regard to several of the proposals referred to specifically in the Resolution.

1. With reference to the proposal that millers should be required for a period of one month to use an admixture of 20 per cent. of English wheat, I am to say that the Minister is advised that the proportion of English wheat used is on the average approximately 18 per cent., and that in the opinion of the Flour Mills Control Committee no substantial benefit would be obtained by prescribing a fixed proportion in all cases.

2. With regard to the percentage of extraction, I am to point out that the rate of extraction has recently been lowered from 76 to 75 per cent. In response to representations from this Department, the Ministry is informed by the Flour Mills Control Committee that a new rate will come into force on the 20th December by which the extraction will be still further lowered

to 73½ per cent. and to 72 per cent. if more than 15 per cent. of British wheat is used. The Minister is advised that in the opinion of the Flour Mills Control Committee this rate affords ample inducement to millers to use the maximum quantity of British wheat.

With a view to emphasising the importance of this matter, however, a letter has been addressed to the Wheat Commission urging that continued attention should be given to this point with a view to the rate of extraction of British wheat being kept proportionately low as compared with foreign wheat.

3. With regard to the free export of British wheat, representations have been made to the Wheat Commission with a view to the export of wheat for seed purposes being allowed without any restriction other than the issue of a licence on the recommendation of this Ministry. It is hoped that it may be possible to give effect to this proposal at no very distant date, though at the moment it is not possible to give any definite assurance on the point.

4. The suggestion that millers should be permitted to sell flour made exclusively from British wheat at a price lower than the controlled price of ordinary flour has also been submitted to the Food Controller with an urgent request that it may receive favourable consideration. The Ministry has, however, reason to doubt whether it will be possible to give effect to this proposal.

5. As regards the Cereals (Restriction) Order, the Minister is informed that this Order has been revoked by the Food Controller and that a notification to that effect is now being issued.

6. Lord Lee trusts that the National Farmers' Union will realise from the information given above that every possible step is being taken by this Ministry to assist farmers in securing a better market for home-grown wheat.

At the same time, he feels bound to remind the Union that millers are under no obligation to purchase grain which is not required to meet current needs, and that in a number of cases the relatively low prices which have been realised have been due to farmers pressing millers to purchase wheat to an extent which is in excess of current milling requirements. Another important cause of the low prices realised has been the inferior condition of much of the wheat recently offered for sale.

That there is at the present time a lack of demand is undoubted, and this appears to be partly due to a slow demand for flour by bakers, while in addition farmers have threshed heavily this season, with the result that millers hold large stocks of British wheat.

7. In this connection, I am to observe that the Notice issued by the Ministry of Food, referred to in the fourth paragraph of the Resolution, is presumably the one dated September 16th (P.N. 1181), of which a copy is enclosed. Whilst this Notice was certainly intended to discourage farmers from hoarding wheat until after next March, it can hardly be interpreted as an encouragement to thresh exceptional quantities of wheat in the early part of the season.

8. In conclusion I am to say that Lord Lee notes the opinion expressed in the final paragraph of the Resolution, and that he shares the desire of the National Farmers' Union for the removal of the control of wheat at the earliest possible moment.

I am, Sir, your obedient Servant,  
(Sd.) F. L. C. FLOOD,

A. D. Allen, Esq., O.B.E., Secretary.  
General Secretary, National Farmers' Union.

\* \* \* \* \*

THE following Notice was issued by the Ministry to the Press on the 10th December, 1920 :—

**The Price of Home-Grown Wheat.**

The Ministry thinks it desirable to draw the attention of farmers to the fact that although recently there has been a considerable fall in the price of wheat in America and elsewhere, the present level of world's prices is still such that the price of British wheat of sound milling quality ought not to be affected.

Millers have been directed by the Food Controller that they have authorisation to pay for home-grown wheat of sound milling quality purchased on rail at producer's station, an average price not exceeding 95s. per 504 lb. f.o.r. or 96s. per 504 lb. in respect of wheat delivered by road into the mill. Further, millers have been offered every inducement to use the maximum quantity of home-grown wheat, but in most cases flour containing a large proportion of imported wheat is required by bakers and householders.

It should be remembered that the miller is under no obligation to purchase grain which he does not require to meet immediate needs. The Ministry understands that much of the home-grown wheat which has been offered for sale by farmers during the past two weeks has been either of inferior quality or in doubtful condition, with the result that the full price payable for sound milling wheat has not been realised, while in addition farmers have in many cases been pressing millers to purchase wheat to an extent which is in excess of current milling requirements.

## THE ENCLOSURE OF OPEN-FIELD FARMS.

THE RIGHT HON. LORD ERNLE, M.V.O.

*In a previous article on this subject, published in last month's issue, Lord Ernle dealt with the general question of the enclosure of common land in this country from the agricultural point of view, and pointed out that English history records two great periods of enclosure: (1) 1485-1560; and (2) 1760-1820.*

AGRICULTURALLY, the main objection to the ancient system of common cultivation was its want of flexibility. Under its rigid rules, the methods of farming and the use of land remained for centuries unaltered. But nature defies human regulations. One great change was in progress, and that was the declining fertility of the open-field farms. A holding of 15 arable acres—and the majority were probably less—which had in the 13th century provided the necessary food for a family, failed to produce it 200 years later. The virgin richness of the soil was long ago exhausted; year after year much had been taken out and little put back; considerable tracts of land could no longer be profitably tilled for corn. Reliable statistics are not available on so extensive a scale as to demonstrate in conclusive fashion the degree to which the yield had declined. But such figures as can safely be used seem to show that, even on demesne lands, the produce of wheat per acre had fallen from the neighbourhood of 10 bushels in the 13th century to between 6 and 7 bushels in the 15th century.\* They also suggest that a smaller area was under wheat; in other words, that only the best soil was tilled for corn, and that inferior land had dropped out of arable cultivation because it no longer produced enough to make tillage profitable. If this was happening on the enclosed demesnes of churchmen like the Bishop of Winchester, managed with the highest farming skill of the day, it is not unreasonable to infer that the open-field farms were at least in no better

\* On the demesnes of the Bishop of Winchester wheat was grown in 1208-09 on 6,838 acres, and in 1396-97 on 2,366½ acres. On the Manor of Whitney, a similar decline is marked from 417 acres in 1209 to 51½ in 1397. The yield in 1397 was on the Winchester land 6 bushels, and on the Whitney land 6½ bushels, to the acre. The 13th century work on agriculture, known as Walter of Henley's *Husbandry*, calculates the expected yield of wheat per acre at 10 bushels.



plight. It is extremely improbable that the lands enclosed for the private use of manorial lords were naturally inferior to those left in common cultivation, and the folding rights of the manor secured the largest and most concentrated supply of manure to the demesne. Where land was in several occupation, tillage could be converted into pasture and *vice versa*. Under the rigid system of common cultivation, no such change was possible. Once under the plough always under the plough was the rule. Though no figures are recorded to show the yield of open-field farms, it is natural to suppose that the decline in production was as great, if not greater. To the smaller partners in the association the failure of fertility meant progressive destitution. They had no means of arresting the decline, which showed itself in the abandonment of portions of ploughland, and the frequent appearance of "leas" in the midst of the arable fields.

Evidence exists to show that in the 15th century many holders recognised the hopelessness of their prospects by their refusal or reluctance to take land. From natural causes the open-field system was breaking down. Soil exhaustion was squeezing out the smaller men. A man with 15 arable acres, yielding 10 bushels to the acre, had, deducting seed, a bread supply for five persons from the 5 acres annually under wheat. If the yield was reduced to 5 bushels or less, the bread corn only sufficed for two and a half persons. Much of the poverty and misery of the rural population in both the great periods of enclosures may be fairly attributed to the decreased productivity of the land, though before the later period the peasant had been able to supplement the scanty yield of the soil by the money earnings of his domestic industries. When these handicrafts were swept into factories, the open-field system, unless it could be so modified as to allow the adoption of new agricultural resources, was doomed to disintegration by its own inherent defects.

It is only just that this central agricultural fact should be borne in mind in approaching either of the two great periods when the continuous process of enclosure excited the strongest criticism. In 1485-1560 the only remedy for the exhaustion of fertility was the conversion of the worn-out arable land into pasture, and the substitution of existing grass-land for the necessary tillage. In 1760-1820 there was an alternative remedy. It lay in the adoption of the newly-discovered resources of the farmer, and the introduction of clover.

temporary grasses and roots, and the application of the more abundant manure which the increased facilities for stall feeding in the winter months provided. In the earlier period, the first remedy was adopted, in the later period, the second. In both the agency was enclosure, either of a part of the land or on a scale which involved the break up of the agrarian partnerships. Commercial motives, no doubt, operated to accelerate both changes. There was money to be made by enclosures. But from the economic point of view the movement was necessitated by the national interest in the maximum yield from the soil of the country.

Within the framework of the open-field system, enclosure was at work. The weaker men were dropping out, and the more substantial men were taking up the vacated holdings. By arrangement among the tenants there was also an interchange and consolidation of intermixed strips. In both cases the change was often followed by piecemeal enclosure for separate use, either temporary or permanent. But the process was so slow that it excited little comment or apprehension, though its social effect was to increase the growing number of landless men. The smaller holders who were able to survive, did so through the common rights of pasture. If their arable strips yielded little or no produce, their retention, though unfilled, carried with them the right to pasture their live stock. Even where a man had vacated his arable holding, he still clung to the privileges which it had conferred, especially the common shackle in the stubbles of the open fields. Many of the common rights thus exercised were a breach of the open-field system, and had their origin in sufferance or encroachment.

It was not till the period 1485-1560 that the enclosing movement, long in progress, reached a height which alarmed the country. The ephemeral literature to which it gave birth must be taken with the proverbial grain of salt. There was much exaggeration as well as truth in the description of its social consequences. The contemporary explanation, widely disseminated, was that the progress of enclosures, and the extensive conversion of tillage to pasture, were due to the greed of landowners. Tempted by the high prices of wool, so ran the charge, the landowners, and especially the new ones, evicted the open-field farmers from the arable land, meadows and common pasture of the village farms, and turned the whole into sheep walks. A shepherd and his dog took the place of

populous hamlets. Sheep, "that were wont to be so myke and tame, and so smal eaters," turned into devourers of human beings :

"They have eate up our medows and our downes  
 "Our corne, our wood, whole villages and townes ;  
 "Yea, they have eate up many wealthy men,  
 "Besides widowes and orphan children."

The occasional truth of this picture is confirmed by the eloquent pen of Sir Thomas More in his *Utopia* (1516). That the result of enclosures of a wholesale and drastic kind was depopulation cannot be disputed. In particular instances the popular charge was true. It may be questioned whether those instances were typical or exceptional. At this distance of time it is difficult to give any certain or definite answer. But the evidence collected by the Commissions of the 16th and 17th centuries goes to show that enclosures of whole townships were rare. The period coincides with the break-up of feudal households, the Dissolution of the Monasteries, and industrial reconstruction. A flood of pauperism swept over the country, and no doubt agricultural changes contributed to its volume. Numerous insurrections attest the discontent of the rural populations. It suited the dominant political party to emphasise the agrarian causes and to ignore those which originated in the vast religious changes that were taking place.

It may also be worth while to notice the nature of the motive to which enclosures were attributed. It was alleged that, owing to the great development of the woollen manufacturers in the early Tudor period, the price of wool rose to such a height as to encourage the abandonment of corn-growing for sheep-runs. No doubt commercial motives of this nature accelerated enclosures. But if, during the period when enclosures were proceeding most rapidly, the price of wheat remained relatively higher than that of wool, some additional reason other than trading profit must be found for the conversion of arable into pasture. That reason, it is suggested, is supplied by the exhaustion of the existing corn-land, especially on open-field farms, and by the necessity of restoring its fertility by a prolonged rest under grass. Thus sheep were as much a by-product or result of enclosure as they were its direct object or cause. This view is confirmed by the trend of prices. Enclosure of a piecemeal kind had been going on throughout the 15th century; it received a great expansion in the forty years following 1485, and took, more and more,

the shape of grass and sheep farming. Was the rise in the price of wool, relatively to that of wheat, so great as to afford a sufficient temptation to make the change? During the whole of the period 1270 to 1430, the price of wool had been consistently higher than that of wheat. But from 1430 to 1540—the period during which the progress of enclosures excited most alarm, and was attributed to the superior profits of sheep farming—this relation was completely reversed, and the price of wheat, in every decade but one, was higher than that of wool. It is true that in 1541-50 the price of wool suddenly soared high above that of wheat, but that was after the original force of the movement was to some degree spent. The general trend of prices seems to show that the usual explanation of the immense profits derived from sheep farming will not satisfactorily account for the extension of pasture. Some other reason must have lain behind the movement. It is submitted that that reason was agricultural, and is to be found in the exhaustion of the existing tillage land, and in the consequent difficulty of maintaining the open-field system.

The following table\* of the decennial average prices of wheat and wool for 1361 to 1561 illustrates the foregoing statements:—

	Wheat per qr.	Wool per tod.
1361-70	7. 3 $\frac{1}{4}$	9. 3
1371-80	6. 1 $\frac{1}{4}$	10. 11
1381-90	5. 2	8. 0
1391-1400	5. 3	8. 4
1401-1410	5. 8 $\frac{1}{4}$	9. 2 $\frac{1}{2}$
1411-20	5. 6 $\frac{3}{4}$	7. 8 $\frac{1}{4}$
1421-30	5. 4 $\frac{1}{4}$	7. 5 $\frac{1}{2}$
1431-40	6. 11	5. 9
1441-50	5. 5 $\frac{1}{4}$	4. 10 $\frac{1}{2}$
1451-60	5. 6 $\frac{1}{4}$	4. 3 $\frac{1}{4}$
1461-70	5. 4 $\frac{1}{4}$	4. 11 $\frac{1}{2}$
1471-80	5. 4 $\frac{1}{4}$	5. 4
1481-90	6. 3 $\frac{1}{2}$	4. 8 $\frac{1}{4}$
1491-1500	5. 0 $\frac{1}{2}$	6. 0 $\frac{1}{2}$
1501-10	5. 5 $\frac{1}{2}$	4. 5 $\frac{3}{4}$
1511-20	6. 8 $\frac{1}{4}$	6. 7 $\frac{1}{4}$
1521-30	7. 6	5. 4 $\frac{1}{4}$
1531-40	7. 8 $\frac{1}{2}$	6. 8 $\frac{1}{4}$
1541-50	10. 8	20. 8
1551-60	15. 3 $\frac{1}{4}$	15. 8

It is not disputed that the extension of sheep-farming was one of the causes of enclosures in 1485-1560. But it is argued that in many cases sheep-walks were themselves the effect of an underlying cause, namely, the decline in the productivity of

\* The table is taken from *The Enclosures in England and Economic Reconstruction*. By Harriet Bradley. Ph.D. New York, 1918.

the soil. The only remedy lay in the restoration of the fertility of the exhausted arable land by conversion to pasture. The legislature endeavoured to cope with the situation by a series of Acts of Parliament directed against engrossing and enclosing. Engrossing meant the accumulation of holdings in the hands of one man. The law attempted to check an economic process which was the inevitable answer to exhausted fertility by preventing any individual from holding more than one farm. The word "farm," which originally meant the stipulated rent for an area of land, had not yet acquired its present meaning of the area of land out of which the rent issues. It was in the transition stage of meaning the definite area of land which afforded a living to a man and his family. It is in this sense that the word is used by Tudor legislators. The caution is necessary, because engrossing in the 16th century had a different meaning from that which it might now bear. The practice, with which we were unfortunately so familiar thirty years ago, of throwing several farms together, amounting in the aggregate to several hundred acres, might be called engrossing. But nothing on that scale was in the minds of Tudor legislators. They meant the additional occupation by one individual of the 10, 15 or 30 arable acres which had once afforded a living to another partner in the open-field farm. They did not inquire whether the area would still have afforded a living. They clapped a plaster to the sore, instead of attempting to remedy the sore itself, which was the exhausted fertility. In a similar way they dealt with enclosing. It was easy to pass an Act of Parliament that the open-field system must be maintained, and that the arable land must be retained under the plough. But, if the land did not return a living under tillage, the Act was a dead letter. At the time it was a frequent complaint that the legislation proved ineffective to check the progress of enclosures. One of the principal reasons why so little attention was paid to the law was that it provided no remedy for the evil it proposed to prevent. It was therefore as powerless as a Pope's Bull against a comet. It was not until the close of the 16th century that this fact was officially recognised. Alderman Box, in 1576, wrote a remarkable memorial to Lord Burleigh, in which he urges the folly of attempting to force men to continue to grow corn on exhausted arable. Twenty years later the principle found legal sanction. A statute at the end of the reign of Elizabeth (1597) recognises the agricultural difficulty. Men were relieved from the penalties attached to the conversion of tillage to grass if

they laid down arable to pasture with the "intente" that such "Grownde shall recover Harte and Strengthe." The change was welcomed by an agricultural member of the House of Commons in the debate on the Bill. "For it fareth with the earth," he says, "as with other creatures that through continual labour grow faint and feeble-hearted, and therefore if it be so far driven as to be out of breath, we may now by this law resort to a more lusty and proud piece of ground while the first gathers strength . . . And this did the former lawgivers overslip, tyeing the land once tilled to a perpetual bondage and servitude of being ever tilled." Even in Tudor times it would seem that Parliament sometimes misunderstood or neglected agricultural difficulties.

It would be interesting to trace the influence of soil on the progress of enclosure. If, for instance, it could be established that the lighter soils were the first to be enclosed, and that, where the soil was deep and rich, the open-field system retained its hold, the view that soil exhaustion was one of the principal causes behind the movement, would be strikingly confirmed. It is obvious that the loss of fertility would be first felt on the lighter land, and that the richer soils would hold out longest. Much evidence might perhaps be quoted in support of this opinion. But there was so little uniformity in the movement, and it was affected by so many other local considerations, that any generalisations would be unsafe. New industrial districts were opening out as woollen manufactures developed; towns were increasing in size; means of communication were improving. Agriculture could not, in these changing circumstances, long continue in the self-supporting stage to which open-field farms were adapted. It was no longer enough that producers should feed themselves. Surplus produce was needed for the support of industrial districts and urban populations. Before the end of the 16th century much of the old arable acreage which had been enclosed and rested as grass was brought back into tillage, and the process of reconversion continued throughout the following century. New land was also brought into cultivation. Where it was reclaimed from forests, it did not interfere with village farms. But when it meant the improvement of common and waste, over which an association of village partners exercised common rights, it struck a fatal blow at the older system. It cut at its root. It deprived the village farmers of privileges which were essential to the tenure of their arable holdings. It was the principal cause of the rural discontent of the 16th and

17th centuries, so far as it was agrarian in its character. It may have become necessary in the national interest; but the land might have been brought into cultivation with less loss to the commoners. The point is social and legal rather than agricultural. But the suggestion of Alderman Box, to whose interesting memorial reference has been already made, was worthy of consideration. He advocates whole-heartedly the cultivation of wastes, but he lays his finger on the difficulty. While the wastes existed, the herbage and other smaller profits were shared by the manorial lord and his commoners; when they were brought into cultivation, the division was at the pleasure of the lord alone. He therefore suggests that the lord and four or five of the gravest tenants, selected by their fellows, should divide and allot the land in proportion to their existing holdings, each allotment to be conditional on its being brought into cultivation within two years.

If the counsel of men like Box had been in some form followed, a bitter controversy and a great social loss might have been avoided. Similar advice had been offered by Fitzherbert, the father of English agricultural literature (1523). It had also been given in one of the most striking economic treatises of the 16th century, *The Compendious or Briefe Examination*, attributed to John Hales (1549). If "everie man," says the Doctor in the dialogue, "that had Right to commen, had for his portion a pece of the same to himselfe Inclosed, I thincke no harm but rather good should come" from enclosure. The demand for "three acres and a cow" has a most respectable antiquity. Thomas Becon (1549) suggested that landlords should attach to every cottage enough "land to keep a cow or two." On the same line followed Gabriel Plattes (1639). "I would wish," he says, "that in every Parish where Commons are enclosed, a corner might be laid to the poore mens houses, that everyone might keep a cow or for the maintenance of his familie two." Throughout the whole Stewart period the protection of the commoners was a commonplace of agricultural writers who advocated individual occupation. It was not enclosure, but its abuse, to which objection was mainly taken.

On purely agricultural ground the defence of the old system was rapidly breaking down. Fear of depopulation had not been the only motive which had inspired the early legislation against enclosures. Scarcely less important as a motive was dread of the loss of bread supplies by the reduction of land

under the plough. The fear was crystallised in the Elizabethan prophecy: "No balks, no corn"—in other words, that no grain would be grown on enclosed land. But alarm on this score soon proved to be a bugbear. The supply was greater than before. The area under corn rather increased than diminished. The yield of wheat per acre also rose on the new land brought into cultivation, and on the older arable when it was reconverted to tillage, until it is said to have reached 20 bushels. These results were recognised in 1619 in the appointment of a Commission to grant licences for the conversion of arable land to pasture. After referring to the old legislation on the subject, the Proclamation states that "the quantitie and qualitie of errable and corne lands at this day doth much exceed the quantitie that was at the making of the saide Lawe." It goes on to say that, as the want of corn "shall appeare or the price thereof increase, all or a great part of those lands which were heretofore converted from errable to pasture and have sithence gotten heart, strength and fruitfulness, will be reduced to Corne lands againe, to the greate increase of graine to the Commonwealth and profite to each man in his private." With occasional rises in price, due mainly to bad seasons, civil war, or currency disturbances, the supply of corn for the next 180 years was abundant, steady and relatively cheap, in spite of the growing population and the considerable export of grain which continued up to the beginning of the long war with France.

With ocular demonstration that corn-growing could and would flourish on enclosed land, the discussion of the open-field system enters on a new phase. Attention begins to be increasingly concentrated on the obstacles which village farms presented to the introduction of improved farming, and on the economic loss that they inflicted on the community by their waste of land. - Agriculturally, the interest of the Elizabethan and Stewart periods lies in the numerous improvements in methods and in the increased resources which were suggested to farmers. This progress may even be said to date from Fitzherbert. Both he and Tusser (1557) were enthusiastic advocates of enclosures on practical grounds. Their writings show in detail many of the ways in which, even in the existing state of agriculture, open-field farmers were handicapped. But as a general rule they suggest no improved methods of farming. In only two points can Fitzherbert claim to belong to the new school, but both are important. He pleads for attention to



the breeding of live stock, and he shows his perception of the future of mixed husbandry and of the alliance between the sheep-fold and the corn-bin, or between the bullock-yard and the granary, when he says that the man who tries to grow corn without stock, or to keep stock without corn, must either be "a buyer, a borrower, or a beggar." But with the Elizabethan and Stewart writers the suggestion of new practices, new crops and new rotations are multiplied. Between 1577 and 1689 most of the changes which have revolutionised British farming in the 19th century were discussed and foreshadowed in agricultural literature. We have, for example, the field cultivation of rape, of "Trefoil or Burgundian Grass," and of turnips suggested in 1577. Lucerne followed early in the next century, and potatoes in 1664. We have, in 1594, the scientific manuring of arable and pasture discussed, a great variety of fertilising substances recommended, the waste of the valuable properties of farmyard manure condemned, and closed covered receptacles suggested. The value of Peruvian guano was recognised in 1602. The drilling of corn instead of broadcast sowing was urged in 1604, and a drill patented in 1634. Before the end of the 17th century the aid of science was invoked, and an Agricultural College demanded. Oil cakes, silos and ensilage had been observed in use abroad, and their introduction recommended. Drainage was discussed by Walter Blith in 1649, with a sense and sagacity which were unrivalled until the 19th century and Smith of Deanston. The abolition of "slavish customs, the extinction of vermine," and the recognition of tenant right, sound modern demands; but they were strenuously urged in 1649. Cumbersome antediluvian implements were condemned, and numerous inventions patented. The "reaping car," the double-furrow plough, the drill which made the furrow, sowed the seed and deposited the manure, show that agricultural pioneers were attending to machinery. Greater attention to stock breeding was recommended. Breeds of cattle are distinguished according to the purposes for which they should be bred: this is reckoned the best for meat, that for draught, that for milk. Similarly, sheep are distinguished by the quality of their wool. Pigs take a prominent place as being "the Husbandmans Best Scavenger and the Huswifes most Wholesome Sink"; but as to breed no county has a better than its neighbour, unless it be Leicestershire.

Here are indicated by agricultural writers in the 16th and 17th centuries, some of the most important features in the

immense advance which was made in English farming from 1780 onwards. It is from this new point of view that open-field farms are discussed. New and formidable arguments are based on the new means of agricultural progress. On the arable land of open-fields, subject to common rights while fallow or from corn harvest to seed-time, it was impossible to introduce the new crops. Rotations were limited and fixed by immemorial usage. No individual could move hand or foot to effect improvements, without the unanimous agreement of the whole body of joint occupiers. If one man sowed turnips, it would be the live stock of the community that would profit. Better stock breeding was impossible when all the grazing was in common. The difficulties of drainage were enormously increased by the necessity of securing co-operation. To these new arguments must be added the agricultural condition of many of the village farms. The evidence on this point may be, to some extent, prejudiced, because it comes from the advocates of progress. But it is so uniform in tenor and character, so confirmed by previous experience, and so consistent with the natural results to be expected from the rigidity of open-field farming, that it must be allowed some weight. The yield of the arable land was comparatively small and poor in quality. The commons were "pest-houses of disease," and the live stock that were reared on them were dwarfed and undersized. Large quantities both of the arable and pasture were worn out. Many open-field farmers lived "worse than in Bride-well."

The argument drawn from improved methods and increased resources would have been more forcible if the suggested changes had been put in practice on enclosed land. For the farmers' reluctance to accept their advice agricultural writers were themselves frequently to blame. Their folly was often as conspicuous as their wisdom. Their promises were ridiculously extravagant. Moreover, several of them had failed in practical life. Tusser, "teaching thrift, never throve"; Gabriel Plattes, the "corn-setter" and inventor of a drill, is said to have died shirtless, in the streets of London, for want of bread. Arthur Young had failed twice in farm management, before he began his Farming Tours and his crusade in favour of large farms, long leases and capitalist farmers. Even Bake-well, of Dishley, the pioneer of scientific stock breeding, went through the Bankruptcy Court. Apart from the low standard of education and the isolation of rural districts, the contempt

of practical men for book farmers may be explained, if not justified. Until the test of experience had sifted the useful suggestions from the foolish, the farmer answered for his class when he replied to the suggestion that he should try clover, "Gentlemen might sow it if they pleased, but farmers must pay their rents."

What was wanted was a lead, and in the 18th century it was given by the landowners. They initiated experiments, and poured their money into the land. Farms were at great cost adapted to modern methods by new buildings, roads, fences and drainage. Much of the land was literally "made" during the period. A wave of agricultural enthusiasm rose with each decade of the period, until at last it swept over the country. The introduction of roots, clover and artificial grasses solved the problem of winter keep. It enabled farmers to carry a larger head of stock. More stock yielded more manure; more manure raised larger crops; larger crops supported larger flocks and herds, which were both better bred and better fed. The agricultural circle seemed to promise indefinite expansion.

It is not the purpose of this article to describe the agricultural revolution of the latter half of the century. But its effect on open-field farms is obvious. The stream of prosperity passed them by. They were, so to speak, mediæval backwaters. Unless their system was transformed, they could not adopt the improvements which, on enclosed land, were so marvellously increasing production. Yet still, so long as population remained stationary and food was abundant, the old battle was renewed again and again. On one side was pleaded the injury which the break-up of open-field farms and the partition of commons inflicted on small occupiers and commoners. On the other were urged, with ever-increasing force, the obstacles to farming improvements which were presented by open arable fields, the unprofitable use of land occupied in common, and the commercial and productive advantages of enlarged separate holdings. Much was still to be said on both sides. It remained a question of the balance of national advantages. In the early part of the century the open-field farms dropped out gradually and slowly. Inclosure Acts were now the recognised procedure in enclosing open-fields, commons and wastes. From the reign of Anne to the accession of George III their number was small, and some of the earliest included in the list were confirmatory of previous arrangements. From 1760 onwards they rapidly multiplied under the pressure of necessity. England was suddenly becoming a manufacturing

country. Population was shifting to the North, and collecting into towns. From these new industrial centres, more and more loudly, rose the demand for food. Little room was left for an agricultural system which was only self-supporting. Some effort was made to adapt it to the changing conditions. An Act of Parliament in 1773 enabled a majority of partners in the agrarian association to compel the consent of the minority to adopt the new crops in their rotations. Here and there, but with extreme rarity, instances are recorded of the introduction of turnips and clover in open fields. The Act may not have been made known or pushed with sufficient vigour in rural districts. Anyhow it proved a failure. Enclosure was no longer a question only of social or agricultural advantage; it had become one of economic necessity. The pressure steadily increased in severity. It culminated during the Napoleonic War, when every pound of food became of national value. At the declaration of peace in 1815 the old system of common cultivation had practically disappeared, and the newer system of individual occupation was almost universally installed in its place. Socially the change was a loss; economically its justification is complete. Under the new agricultural system Great Britain had been enabled to keep pace with her expanding needs, and, out of her own agricultural resources, not only to stand the strain of 22 years of war, but in 1840 to supply bread and meat to a population which, as compared with 1760, had more than doubled. It was a task which, unless centuries of experience were reversed, could never have been accomplished by the ancient system of open-fields.

## THE AGRICULTURAL COUNCIL FOR ENGLAND:

### THE MINISTER'S INAUGURAL ADDRESS.

THE following is the text of the inaugural address given by The Lord Lee of Fareham, Minister of Agriculture and Fisheries, at the first meeting of the Agricultural Council for England, at Essex Hall, London, on 9th December, 1920:—

**LORD LEE** :—Mr. Chairman, my Lords, ladies and gentlemen; may I explain, first of all, that I am only here as a guest. I am not a member of this august body. It is, I think, a very proper provision of the Act that this Council should be an independent Council on which officials of the Ministry are in no way represented. But you have been kind enough to invite me here to-day, and I am proud to have this opportunity of addressing the first Agricultural Parliament that has ever been called together in this country. I entirely re-echo what Mr. Royce said when he suggested that this was really an historic occasion—certainly historic so far as Agriculture is concerned. Whilst this is, as I said, a Parliament, it is not a Parliament elected by popular suffrage. But it is representative in the best sense of agricultural thought and experience throughout the country; and I should like, if I may, to congratulate all those who have been selected by the County Agricultural Committees, and other bodies, to meet here to-day. I will have a word to say later about your responsibilities, but before coming to that I should like also, if I may, to add one word of congratulation to the Chairman, Lord Selborne, for the unanimous call which he has received to-day to the Chair on the occasion of your first Meeting. If I may say so, it seems to me peculiarly appropriate that he should occupy this position to-day, because if any one person is responsible for the inception of this Council it is Lord Selborne and the Agricultural Reconstruction Committee over which he presided three years ago. In the Report of that Committee—and both the Report and recommendations, I venture to say, are also going to be historic in the annals of agriculture—he made the following recommendation: “It is advisable to state here that in our opinion the Agriculture Department of each country should, in carrying out its duties, act in constant consultation with a National Agricultural Council or Board which we hope may be formed so as to represent the progressive agricultural thought of the country and fulfilling analogous functions

to those attributed to the German Agricultural Council." I do not like to think that this Council has been designed on a German model, but at the same time we must not be above learning even from our enemies. I have been looking at that paper of Sir Thomas Middleton's on the German Agricultural Council. I am glad to say we have not adopted its colossal German name, nor do I hope that we shall have the honour that that Council had of being addressed at intervals by the Kaiser himself. But, ladies and gentlemen, there is one observation in that paper which I think we might lay to heart and it is this:—"The great respect which the German Agricultural Council enjoys to-day, not merely in agricultural circles, but amongst administrative bodies is due to the extreme thoroughness which is characteristic of its Meetings, its resolutions, and its publications." I think that is a model which we might not be ashamed to follow, even if it be of foreign pattern.

As I see the functions of this Council they are two-fold; at least, they would certainly have a two-fold advantage to agriculture, and to the State. In the first place, I think it is recognised now by everyone that it is very advisable that Government Departments, Administrative Departments, bureaucratic departments as they are sometimes described, should be kept in the closest possible touch with instructed public feeling and opinion with regard to the matters with which the Departments have to deal. I am sure they always try to do so, and have always tried to do so. But it is not always easy. The public view filters into them through many official channels, and they may not always get the real article. Therefore, I think it is in the first place of the utmost advantage to the Government Department concerned to have an opportunity of receiving regularly, and fresh from the source outside, instructed opinion with regard to the particular business of the Department; and there is no way in which that can better be done than by coming in contact frequently and regularly with a Council such as this representing the industry in every part of the country. On the other hand, I think it is an important thing for the public and those engaged in representing the interests of a great industry such as agriculture in this country, to come in contact with the Department and to realise, what sometimes is difficult to realise, the special difficulties with which any Government Department is confronted in doing its best for the industry for which it is responsible. Governments have their difficulties and their worries like other people. They are naturally more exposed to criticism, and

rightly, than the ordinary members of the public; but I personally do welcome this opportunity of the Department coming into contact with this Council in order that you may recognise our difficulties, and, I hope, the sincerity of our desire to assist the industry, even when we do not always do exactly what you wish. On the other hand, we shall get from you a direct expression of the wishes and views of the industry, and, if necessary, be able to explain to you face to face what we can do and why possibly we cannot go in the direction that you desire. Hitherto this contact between the outside and inside, if I may so describe it, has largely been conducted through the medium of parliamentary questions, and so forth; but I am sure you realise that in these circumstances the Government or the Department concerned is necessarily and officially on the defensive, and I am not sure that that is the best way of exchanging confidence and views. This is an entirely different method, and I think a much better one. For that reason, as I say, I greatly welcome on behalf of the Department the assistance and guidance of this Council.

These ideas, which I have ventured to outline, materialised in the Ministry of Agriculture and Fisheries Act of last year which set up this Council and which prescribed how it should be constituted. It consists, as you know, of two members from each County Agricultural Committee, six members from the Agricultural Wages Board, and 36 members nominated by the Minister, and that is the body which has met here for the first time to-day.

May I say at this point one word about the composition of the Council, and particularly with regard to the Minister's nominees. The duty was placed upon me by Parliament to select 36 members of this Council. It is true that there are certain statutory qualifications with regard to representation of certain branches of the industry, and so forth. Those, of course, I have strictly observed. But discretion as to selection was deliberately placed by Parliament in my hands, as the responsible Minister for the time being, and I have endeavoured to discharge that responsibility with due regard to all the interests concerned. I am aware that in so doing I have incurred—and I do not complain—criticism in some quarters, because the nominations I have made may or may not meet with the full approval of this or that interest. But, ladies and gentlemen, whilst that is a matter upon which I am quite prepared to receive criticism, I am not prepared to surrender my responsibility; but I say this, quite sincerely, that in making my selections I have been animated

only by the one desire to see that every section of the industry is adequately represented so far as the constitution of the Council will permit, and in making my choices I have considered the individual far more than I have considered any organisation. I attach much more importance to men than I do to measures or even to organisations, and in the choices I have made I have tried to select those individuals who seem to me qualified, either by their special knowledge, experience and reputation, or sometimes by geographical considerations. I think it is important that the various parts of the country should be as well represented as possible, but I have been animated by these motives in making my choices and not by any consideration of whether individuals belong to this or that organisation. I am aware that I am exposed to criticism on that point, but I thought it just as well to explain to the Council at the start the principle upon which I proceeded.

I do not know whether it was expected that on an occasion of this kind I should make any statement to the Council with regard to agricultural policy. Let me say at once I do not propose to do so, because this is, after all, an inaugural Meeting. It is not a Meeting, and never will be a Meeting, called together for the purpose of hearing the views of the Minister of Agriculture, unless he is asked by the Council to give them on any particular question which you are inclined to discuss. It is, if I understand aright, your business to select the subjects which you wish to discuss and to call upon, when need be, the Minister of Agriculture, or any representative of the Department, to give you information, to explain what is being done, and to listen to any views and advice that you may be prepared to give. Therefore, I do not propose to say a word about agricultural policy to-day. You are aware what the agricultural policy of the Government is at the present moment. It is at present on the rack in their Lordships' House. It emerged breathless from the Second Reading last night, and my labours are by no means concluded. But there are many other questions affecting agricultural policy which will come up from now onwards, and this Council, I think, affords an opportunity for agriculturists of all sections to join together in considering and formulating what future policies may be in the interests of the industry. I feel certain that this Council, constituted as it is, and animated as it is, will, in all circumstances, put the National interest before any sectional interest of this or that side of the industry. You are, as you are well aware, a perfectly independent body, free



to express your opinions, free to arrange your own business and procedure, and in no way subject to my control. That does not preclude the closest possible co-operation between you and the Ministry and certainly anything that the Ministry can do to assist you in your deliberations will be most willingly done.

Now, ladies and gentlemen, there is one point to which I feel bound to allude. Up till now the Ministry has not had the assistance of any advisory body, or any body representing the new organisations of agriculture throughout the country; but there has been in existence one body which has performed a most useful function, if I may venture to say so, up to now, and that is the Federation of Agricultural Executive Committees. That was, it is true, an unofficial body, but it did represent in a sense a Council of Agriculture so far as it was possible to form one at that time. We have now an official statutory Council representing the County Agricultural Committees throughout the country, with delegates from every one of them, and I am frankly a little anxious as to what might happen if there were a division of authority between the Federation of Agricultural Executive Committees and this Council. It seems to me, if I may say so, that it will be very difficult for both bodies to exist at the same time, giving possibly contrary advice to the Ministry upon questions of policy. I have no power or desire to influence the decisions of an independent body like the Federation of Agricultural Executive Committees, though, of course, the Agricultural Executive Committees no longer exist, and I cannot help feeling that it would be perhaps wiser, and more calculated to produce a united voice in agriculture in the future, if the Federation of Agricultural Executive Committees allowed itself to be merged in this representative and statutory Council, so that agriculture on all future matters of policy should speak with one representative voice.

You are aware that under the terms of the Act this Council elects, or at least very largely elects, the Agricultural Advisory Committee which is to be a body constantly at the elbow of the Minister "to advise him with respect to all matters and questions submitted to them in relation to the exercise by the Ministry of any of its powers or duties with regard to agriculture, and with liberty to make recommendations to the Ministry with regard to other matters affecting agriculture or rural industries." That Committee, which is the Cabinet of your Parliament, is a body of the very first importance. As I see the future, you will have a Minister of Agriculture supported, on the one hand, by

this Council, and constantly advised by the Agricultural Advisory Committee, with regard to all technical and other agricultural matters; whilst, on the other hand, he will have, within the Department itself, his Administrative Council to advise him with regard to purely administrative questions. He will thus be supported, on the one hand, by agricultural experience, and, on the other hand, by administrative experience, each expressed in the terms of an Advisory Committee. The Agricultural Advisory Committee is intended by Parliament to meet frequently, at least once a month I hope, or as many times oftener as is desired, and will be presided over by the Minister himself.

Your first duty now is to elect your respective members of that Advisory Committee. With regard to that I wish to say this. Up till now the Minister has had to appoint, and there are now in being, a number of Advisory Sub-Committees on technical questions, and we shall have to consider a little carefully what the relation of those should be to the Central Advisory Agricultural Committee which will now be set up. One thing is quite clear in my mind, that those Sub-Committees must be closely in relation with, and indeed, I think, co-ordinated by, the Agricultural Advisory Committee which will represent you. That, however, is a matter which can be discussed with the Committee when it is constituted. I hope that when all this organisation is complete there will be an effective and workman-like chain of responsibility reaching all the way up from the Counties to the Ministry, which will have a very real influence and effect upon future policy and administration.

I see later on in your Agenda there is a question of the date of your next Meeting. It is not for me to say when you should meet or when you should not meet, but I am very anxious that this Council should have the earliest possible opportunity of expressing its opinions and that I should have the benefit of those opinions on the burning questions of the day as soon as possible. There is only one subject down for discussion on the Agenda paper to-day, and I venture to suggest very respectfully, although it is a matter entirely for you to decide, that having got over your more or less formal inaugural business to-day the next Meeting of the Council should take place very shortly, and that in the meantime subjects which are desired to be discussed should be sent forward in the form of resolutions or motions, so that the next debate, in fact the first real debate, on agricultural policy should not be put off for six months as is suggested. That is not my business, but it is an expression of my real and sincere

desire that I should have the advantage of hearing the views of this Council upon agricultural questions at the earliest possible moment.

Now, ladies and gentlemen, I have only this to say in conclusion, that I am most grateful to you for giving me this opportunity of welcoming you on the occasion of your first Meeting, and of assuring you once again, which assurance I am sure you will accept, that I want this to be a real Council, a real advising body; I do not want it to be in any sense merely a debating society. If it is your desire that on any future occasion or occasions I should attend in order to hear your advice or to give you an expression of the views of the Ministry on any matter, I shall be entirely at your disposal. When I say "I shall be" I mean not only myself, but all my staff at the Ministry will make it their business to come here and to give you every assistance and advice in their power. ("Hear, hear.")

**LORD BLEDISLOE** :—My Lord, before the Minister of Agriculture leaves us I should like to propose a sincere vote of thanks to him for his presence here to-day, and for the encouraging words with which he has inaugurated what he has so properly called the new Agricultural Parliament. There is one statement he made which I think must have brought a great sense of relief to the minds of many here present—that in spite of any appearances which the platform might convey to our minds it is his intention that this body shall be perfectly free as an Agricultural Parliament to express its own unfettered views on the subjects that come before it. I am quite certain, if I may tell his Lordship so, that he will derive more real benefit from our deliberations if we have a consciousness that we are free to deliberate according to our own ideas and on matters upon which we may entertain rather strong views without being in any sense dictated to from Whitehall. I take this opportunity of saying to Lord Lee that, although we may not all agree with all his views, we do recognise in him a real champion of the industry in which we are all interested. We all recognise his extreme courtesy, his obvious fairmindedness, and his great courage in dealing with somewhat difficult and sometimes very delicate questions. If I may say so, for myself, I hope we may always find presiding over the new Ministry of Agriculture as capable and able and fairminded a man as Lord Lee of Fareham.

Lord Lee referred to the Federation of Agricultural Executive Committees over which I have had the honour of presiding for the last two years. We have no desire to perpetuate our exist-

ence unless we can fulfil some really useful purpose, and the sole question is whether this new Council of Agriculture for England, and, of course, Wales too, will adequately cover the ground. If the Meetings of this body are sufficiently frequent, and if they are able to deal with all the administrative matters upon which representatives of the new County Agricultural Committees will naturally from time to time want to confer, I for my part shall certainly not advocate the perpetuation of a body which will only mean duplicating work and unnecessary overlapping. I might mention that we are in negotiation with the County Councils Association with a view to their possibly establishing an Agricultural Committee similar to their Education Committee which will be able to hold Meetings from time to time of representatives of the new County Agricultural Committees to consider purely administrative matters. So long as this body is prepared to consider administrative matters, well and good. My only fear is that it will find itself too large a body to enter into technical details concerned solely with administration. All I want to leave upon Lord Lee's mind is this: we do not want to perpetuate our existence for a single day if we can fulfil no real and useful purpose.

**MR. ROYCE** :—My Lord, I should like to second, if I may, this vote of thanks to Lord Lee. I am sure Lord Bledisloe has so very clearly stated the feeling of this Council with reference to Lord Lee that any words from me cannot be useful, but I would like to say, so far as my personal knowledge of Lord Lee is concerned, in relation to agriculture I can re-echo every word that has fallen from his Lordship's lips; and although there are some people who do not quite agree with Lord Lee in some of his views, as, for instance, the ploughing of grass land, I am sure we are all united and are of one opinion in believing that he is absolutely devoted to the interests of agriculture, and that if at any time he is removed from the great position he now holds—I suppose Governments are not eternal—I hope in the interests of agriculture he will be succeeded by someone equally interested in and equally devoted to the interests of agriculture.

**LORD SELBORNE** :—It has been moved and seconded that this Agricultural Council for England passes a vote of thanks to Lord Lee for his inaugural address.

(The resolution was put to the Meeting and carried with acclamation.)

**LORD LEE** :—My Lords, ladies and gentlemen. I am extremely grateful to you for the way in which you have received this resolution, to my friend, Lord Bledisloe, for moving it, and to Mr. Royce for seconding in such generous terms.

With regard to Lord Bledisloe's remarks may I say this. I admit with one solitary exception the composition of this platform, as he called it, might create the unfortunate impression that he mentioned, but may we look upon it in this light, that, always excluding my noble friend, the Chairman, this is not the platform but the dock, and, as is not *unusual*, the dock is elevated above the rest of the Court in order that the features of the criminals may be clearly revealed to all present.

With regard to what Mr. Royce said, I can assure him that the suggestion that I am possessed with a mania for ploughing up grass land is just as unfounded as it would be to say that some General whose business it had been to fight through the war was still animated by a mania for killing in times of peace. The two epochs are entirely different, and I trust my future conduct in this matter will be found proper to peace conditions.

#### ERRATA AND ADDENDA.

pp. 921-927, for *Birchfield throughout*, read *Birchwood*.

p. 921, *Line 3*, for 600 read 510.

*Line 4*, for less than 100 read only 43.3, and for 480 read 460.

*Line 9 from bottom*, for 160,000 read 260,000.

*Line 4 from bottom*, after completed add  
 " Since that time most of the rest of the farm which needed draining has been drained, and a further  $3\frac{1}{2}$  miles of hedges have been removed."

## A MODERN HERTFORDSHIRE FARM : AN EXAMPLE OF UP-TO-DATE METHODS.

THE farm of Birchfield lies about a mile north of Hatfield Railway Station, and is intersected on the eastern side by the Great Northern Railway. It occupies an area of nearly 600 acres, of which less than 100 acres are permanent pasture and about 180 acres are under the plough in regular course of cropping. Lying at an altitude of some 300 feet, the area consists of a flat table-land forming the watershed of the River Lee and the River Colne. Part of the drainage water is drawn to the one stream, and part to the other.

The soils on the east side of the farm are of poor quality, thin and gravelly, and in a dry season show a great tendency to dry out, with the result that the crops burn readily. The west side, on the other hand, is a mild brick earth of a depth of 4 feet in parts, and considerably closer in texture and much more retentive of water than the eastern side. The top formations overlie a thin bed of gravel, below which there is a deposit of blue clay that holds up and prevents the removal of the soil water.

The farm has had a somewhat chequered history, and even through the very favourable period before the more recent years of agricultural depression antecedent to the War, it was reported to be an unsound undertaking from a financial point of view. Much of the better land was in an undrained state, the ditches through long neglect were earthed up, the hedges overgrown and the land overtimbered.

The present farmer began his tenancy in 1893, and at once approached the agent of the late Marquis of Salisbury with plans for the removal of hedges and for the laying of tile-drains. The proposals were approved, and the work was started in October, 1893. The forestry department of the Hatfield Estate removed the trees, and 4½ miles of hedges were taken out by the tenant, who also laid 160,000 tile-drain pipes. All ditches were cleared and laid with pipes. Main or master drains were laid 3 ft. deep, and the laterals 18 ft. apart, at a depth of 2 ft. 6 in. Owing to the flatness of the land the whole of the operations had to be carried out with the use of a spirit level. By Christmas, 1893, the work was completed.

Further improvements were effected by making farm roads, in which the holding was very deficient. Good roads were constructed running practically through the centre from north

to south and from east to west. The farm buildings and home meadows lie centrally to the east of the road running north and south. Chiefly as a result of the wholesale removal of hedges the farm now presents an appearance very different from that which is general in the neighbourhood and indeed very characteristic of much of Hertfordshire. A block of nearly 400 acres of arable land is without a hedge; except for three self-contained fields of 9, 20 and 56 acres, respectively, the area lies in sections, averaging from 50-60 acres each, which are divided from each other by a furrow only.

The farm is run as far as possible on commercial, almost on factory lines. Intensive methods of cultivation are adopted, and the general "lay-out" has been planned to facilitate economy of working. The situation within 20 miles of London and near railway stations and sidings has naturally determined to a large extent the choice of crops grown in the rotation. The systems of cultivation followed furnish a very striking example of up-to-date methods of business farming. Full advantage is taken of the opportunity to produce those articles for which there is a constant demand in the local markets, and to obtain in return the material necessary to maintain the fertility which is lost in removing the crops. In the early years of farming under the improved system it was an easy matter to obtain stable manure from London at the low price of 2s. per ton on rail, and its extensive use on the land not only afforded a ready means of replacing the loss entailed by the continuous drain on the plant food materials of the soil but also assisted in putting the land in good heart and working condition.

**The Rotation.**—The rotation adopted is the four-course system of cropping, with potatoes occupying the fallow break. The order is potatoes, wheat, seeds, wheat and winter oats.

In the early years, as already stated, London manure was used in great quantity, as much as 40 tons per acre being applied once in the rotation preparatory to potato planting. It was found after eight years, however (*i.e.*, when the land had been twice gone over) that as a result of these high dressings the soft and luxuriant foliage was readily susceptible to potato blight, and that the white crop was very liable to lodge. The system was therefore altered, an application of 20 tons of stable manure, supplemented in the spring, at the time of planting, by a dressing of 7 cwt. of artificial manures, being given instead. A sounder crop of potatoes has been obtained as a result, and the cereals are stiffer in the straw, a matter of importance from the point



FIG. 1.—General View of Birchfield Farm, Steadling.



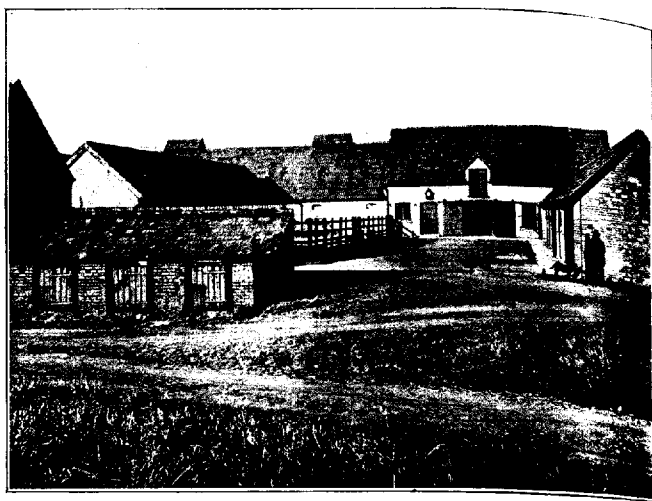


FIG. 2.—Near View showing Cowhouses, Dairy, Food-preparing Shed, Loose Boxes and Manure Court.



FIG. 3.—Implement Sheds.

of view of ease in harvesting and obtaining the largest possible quantity of saleable grain.

Some eight years later sourness, resulting from the constant use of artificials in quantity, became evident, and to counteract this tendency a dressing of 10 cwt. of ground lime per acre is now applied in the rotation every four years. The ground lime is distributed over the rotation grass "break."

**Potatoes.**—Preliminary to planting, the stubble land is marked off over the entire area of the break into 6-yd. squares, by means of a plough, in readiness for the distribution of the farm-yard manure.

The expense of this operation is more than compensated for by the time saved in putting the heaps out and in effecting evenness of distribution. After the manure has been spread on the flat in this way autumn ploughing to a depth of 6 in. is carried out, followed by spring cross-ploughing to a depth of 8½-9 in. The land is then cultivated and harrowed and the drills (28 in. wide) are opened; a depth of 3 in. is the rule.\* A dressing of artificials of the following composition is then sown:—

3 cwt. high grade superphosphate,  
1 „ to 1½ cwt. sulphate of ammonia,  
1 „ sulphate of potash,  
†1½ „ steamed bone flour.

The potato sets are planted by hand 18 in. apart at a depth of 2½-3 in., and are covered in by a medium-weight plough.

A small quantity of the "seed" is boxed. Boxing is only necessary in the case of the later sown crops, which are planted towards the end of April, or, if the weather breaks, as late as May.

The whole crop is sprayed twice.‡ In the case of white-skinned varieties new "seed" is imported from Scotland annually. One year old "seed" of the King Edward variety is found to give as good results as seed obtained direct from the North. The varieties grown in 1920 were King Edward, Great Scot and Ally.

The yield of ware is usually from 6 to 10 tons per acre. A small quantity of seed size is sold, but as a rule all under ware size is used as cattle and pig food.

\* For this purpose a combined furrow opener and manure sower by T. & R. Wallace is highly spoken of by the farmer.

† Steamed bone flour is included to dry the mixture and produce a friable, sowable condition.

‡ A strong and durable machine by T. W. Chafer-Doncaster is recommended by the farmer.

It is interesting to note the modifications in method that are induced by conditions that may be only fugitive in their operation. Some ten years ago the Up-to-Dates were suffering very badly from potato blight, and as much as 50 per cent. of the crop had to be sold as cattle food. The market was overstocked, and prices fell. It was therefore decided to take up the production of milk, which promised to be a more profitable undertaking, and with this view a complete range of new buildings was erected, including a shed for 40 cows. Fifty cows, with 40 in milk, were kept between 1909 and 1915. Milk, however, was very low in price during that period, and in the winter of 1914 a loss of £3 per week was being incurred, not taking into account depreciation in respect of the cows, management and interest on capital. The labourers were dissatisfied with the long hours, and an endeavour to improve conditions by the introduction of mechanical milking plant led to a reduction of the yield per cow, and frequently the udders were spoiled. The herd was therefore sold in September, 1915. By this time the price of waste potatoes suitable for cattle feeding only had risen, and it again became more profitable to sell rather than to use them on the farm. In view, however, of the scarcity of city manure, owing to the increased use of mechanical transport, it may be necessary to consider the desirability of the keeping of a larger number of stock, in order to obtain a sufficient supply of dung, so necessary for the potato crop.

**Wheat after Potatoes.**—A mid-early variety is grown as a main crop, as on stiffish land, such as at Birchfield, the best time of sowing may thus be secured. After the potatoes are off the ground ploughing is performed with a 5-6 in. furrow, and 2½ bushels of seed per acre are drilled in; a white chaff variety is sown on the heavier and better land, and a red chaff on the poorer soils. White chaffs give a low yield on the poor land, while the red chaffs will not stand on the richer soils.

Drilling on the tilth left by the potato diggers has been tried, but the practice is not favoured, as the succeeding crop is found to lack uniformity. Good results were obtained in a dry winter, but when the season was wet the land was lashed too tightly, and it was found almost impossible to obtain a good "plant" of clover. A dressing of 3 cwt. of artificials per acre in the same proportions as in the potato mixture (see p. 923), is given to all the wheat crops. Among the white chaff varieties grown in 1920 were Marshal Foch and Yeoman; the average yield per acre was 6½ quarters. Red chaff varieties are yielding 8½ quarters per acre.



FIG. 4. Farm Cottages.



FIG. 5.—Method of clamping and stacking by sides of farm roads.



FIG. 6.—View looking west along farm road. Potato Clamp bordering field of 75 acres.  
Double furrow recently turned to provide second covering for Clamp.

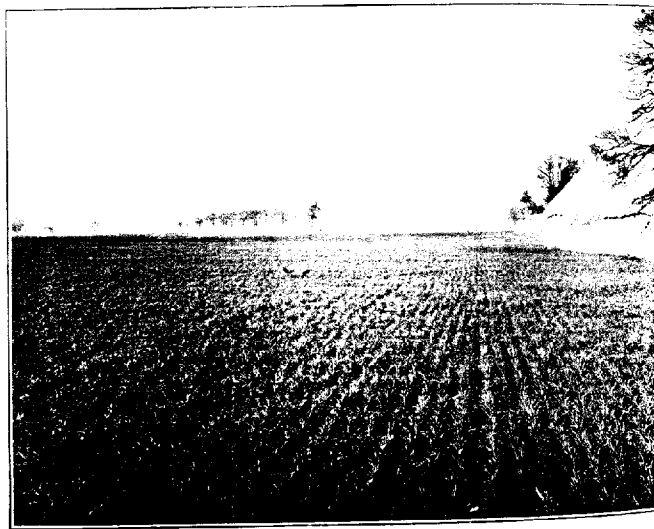


FIG. 7.—Open view across field of Winter Oats showing clearance of trees and hedges.

**Grasses and Clover.**—The “seeds” mixture used was as follows:—

- $\frac{1}{2}$  bushel Italian Ryegrass,
- 8 lb. English Red Clover,
- 2 „ Alsike,
- 2 „ Trefoil.

The mixture is sown by barrow in April, harrowed in and rolled down. As mentioned above, 10 cwt. of ground lime is applied to the seeds break in early winter. The general custom in Hertfordshire is to grow pure crops of clovers only, or sainfoin only—the latter is popular on the chalks in the northern part of the county. By this means the same leguminous crop occupies the ground once in 8 years, and the danger of loss by clover sickness is greatly lessened. The addition of grasses to the mixture, however, which is a feature of “seeds” cultivation at Birchfield, does not find favour generally, as grasses encourage the wireworm. The tenant of Birchfield points out that this danger is only present when the crop is allowed to grow through the season with the object of a second cut of hay being taken. When only one cut is taken the land can be ploughed immediately—in July—and in this way the wireworm danger may be very largely overcome. The land may also be bastard-fallowed, and thus a further opportunity of cleaning is offered during the rotation.

**Wheat and Winter Oats.**—Half the break is sown with wheat, and half with winter oats. The dressing given is the same as for the wheat crop. In the case of the oats, 3 bushels of seed are drilled in. (Spring oats are very uncertain here, but when grown a seeding of 4 bushels is the rule.) “Regenerated Grey Winter” is the variety used at present; it ripens later by 8 to 10 days than the ordinary variety. The yield in 1920 is expected to be about  $6\frac{1}{2}$  quarters. The proximity of London, with its enormous market for all kinds of produce and the availability of dung, has, as already mentioned, largely determined the system of farming adopted, but owing to the reduced supplies of this manure available it has been found more economical to sow leguminous plants with the white crop to provide the necessary fertility in readiness for the potato crop. White clover is ordinarily used, but of late years, in consequence of the high cost of that seed, Alsike and Trefoil have been substituted. The amount sown is 4-5 lb. per acre, and at the time of writing one field in particular is showing a close crop which will in due course be ploughed down as green manure. A serious difficulty in the

growing of this crop is the incidence of "Clover Sickness." The tenant is of opinion, however, that this trouble may largely be avoided by deep ploughing once in the rotation—in this instance by the very deep second or cross-ploughing of the potato-break in the spring.

**Stock.**—As much of the crop as possible, including hay and straw is sold off the farm, and only the working horses, and a few cattle to consume the offals that cannot be sold, are kept. Twelve horses are employed on the farm, except in autumn, when the number is increased to 16, and three tractors are now kept. No fewer horses can be kept than in the years before the War, as the additional machinery acquired is only sufficient to make up for the diminished labour due to the reduction in the working hours of labourers. The permanent pasture is grazed by heifers or fattening bullocks, 30 to 40 in all; a breeding sow and some store pigs and poultry complete the numbers of the live stock of the farm.

**Farm Buildings.**—A complete range of buildings suitable for the requirements of the farm was erected according to plans supplied by the tenant. The farm cottages are of modern construction and have gardens attached.

**Machinery.**—The most modern types of machinery and implements are used. Threshing is done by a Titan tractor and a 4 ft. 6 in. thresher. All stacks are built on the fields bordering the farm roads, to minimise time in stacking during harvest and to have the ricks isolated in case of fire. A trained blacksmith, provided with forge and workshop, executes all minor repairs. Various makes of potato diggers are employed. The opinion was expressed that there is a great future for the "Hoover" digger. At present, however, the lightness of its construction is a factor against it, necessitating its constant repair. It has a heavy draught, and the best results are obtained when it is drawn by tractor. Special attention is given to storing and the care of implements and machinery.

**Labour.**—A score of men comprise the permanent staff on the farm, and there is a good understanding between the farmer and his workmen. County rates of wages are paid. The young men seem to realise that shorter hours and high wages are only possible by working hard and efficiently.

In the special season of potato-lifting use is made of the local and casual labour available. The period of potato-lifting follows almost immediately the hop-picking time, and the same workers

come back to the farm year after year. Wages for lifters have risen considerably, the current rate being 1s. per hour. Twenty to 25 pickers are required for one digger, and each digger clears 3 to 3½ acres a day.

The farm owes much of its success to the fact that the existence of an important and ready market has been recognised, and the crops selected to meet the demands of the market. Every effort is made to effect economies in working, and as far as possible the fields are arranged so that there is a minimum amount of time devoted to the changing of operations and implements between shift and shift. Birchfield, however, possesses two types of soil, and where, as in this case, two types of soil are present, any one crop must be so far distributed to reduce the risk of loss in any one season to a minimum, since conditions which may be detrimental on one class of soil may be quite the reverse on another class.



## MOORLAND GRAZING : ITS IMPROVEMENT BY HEAVY STOCKING.

CAPTAIN ANTHONY THOMPSON, M.Sc., A.S.I.,

Assisted by Miss D. ANDERSON, B.Sc., N.D.A. (Hons.),  
*Armstrong College, Newcastle-upon-Tyne.*

A STUDY of the measures which have been taken in the past for the improvement of moorland pasture makes it clear that a variety of problems is involved which cannot be solved by a single general remedy, whether manurial or mechanical. Disease, draining, and herbage alone of the many considerations which occupy the hill farmer's mind, may, together or separately, present difficulties which appear insurmountable, and each area needs to be considered on its own merits. The herbage on moorland is very different from that of the lowland pastures. It is the natural food of the stock and game it feeds, and vast areas in Great Britain are not likely to support any better plants. In such areas it would obviously be unsound to destroy the existing herbage, but there are areas capable of improvement, where the coarser hill plants can be made to give way to clover and better pasture grasses, and which, when improved, are of great value to the hill farmer. How far such improvement may be economically possible depends on the difference between the original and improved value of the land, together with the cost of treatment and the period required to effect it.

It appears that much of such herbage has become of a rougher nature since the change on many moors in grazing sheep instead of cattle.\* The period during which this change took place varied considerably in different places, but whether it was comparatively recent or remote, there is no doubt that the effect on the land through the heavier trampling of the cattle tends to "fine" the turf and develop superior herbage. It is only necessary to observe the intakes on our moors and the land around gateways for this to be evident.

In Cumberland and Northumberland considerable areas of moorland are covered with a cloak of slowly decaying organic matter consisting of the remains of the natural herbage and its roots. This peaty covering lies on a variety of soils. In Northumberland it is called "fog," a somewhat confusing name, but

\* Patrick R. Latham, "The Deterioration of Mountain Pastures, and Suggestions for their Improvement," *Trans. H. & A. S.*, 1883.

useful in the absence of a better. The "fog" has been and is the object of experiment.\* Owing to its matted condition it prevents most artificial manures from reaching the soil beneath, and it would seem that the manures are carried away by surface drainage. The same character results in water being turned to a remarkable degree, and even though the "fog" absorbs a considerable quantity, making the surface very wet in rainy weather, the soil below not infrequently is found to be quite dry. Those plants, therefore, which are intolerant of the acid "fog," are denied proper nourishment from the soil itself.

These properties attributed to "fog" have been confirmed by the experiments in North Wales.† Basic slag in Northumberland, and lime in both Northumberland and Cumberland, have effected improvements, though but slowly, and roughly in proportion to the depth, and consequent resistance, of the "fog." Lime in other parts of the country and in Scotland has produced good results, but the post-war cost, including carriage and labour, appears to make its use prohibitive.

Where the "fog" is thin, manures will frequently give good results, provided that there is a suitable herbage to develop. If the resisting blanket of matted turf is reduced or broken up, improvement can be effected, but on account of the difficulty of the operations involved this is not usually a practical proposition. Records of ploughing out such land exist, and there is evidence that considerable portions were once in cultivation, for example, in the country of the North Tyne. On the whole, breaking up seems to be out of the question. The "fog," however, may be overcome by heavy stocking, and though this method is limited in the amount of land which can be captured from the rough moor, the importance of such additions to the better pasture of the hill farm can scarcely be over-estimated.

The interest of Alderman W. Dobson, C.C., of Howgate, Brampton, Cumberland, in the subject, makes possible the following account of improvement by heavy stocking. Alderman Dobson, until May last, was tenant of Tarn House Farm, situated a few miles from Brampton Junction. Cattle appear to have grazed Tarn House Rigg—an area of 300 to 400 acres, at between 800 and 900 ft. above sea-level—down to about 1840, being put on in the spring and mostly disposed of at autumn fairs. At that time much of the Rigg was under heather

\*Capt. Anthony Thompson, M.Sc., "The Improvement of Moorland Grazing," *Jour. of the Newcastle Farmers' Club*, 1920.

†Reports on Experiments, 1917 to 1919; University College of North Wales.

which has since disappeared. The present herbage is stated in Column 1 of the Table on page 933. This Table was drawn up after a rough survey made in July of this year. The value of most of the plants noted was dealt with by Professor Wallace as far back as 1884,\* and touched on more recently in his book on "Heather and Moor Burning." The amount of heather noted on the Rigg was very small, and the heather is evidently a new plant. The cross-leaved heather is rather more abundant. The "Blaeberry," as the Bilberry is known in the North, shows up here and there, and is more scattered than the two plants above mentioned. On the moors beyond and at heights of from 1,800 to 2,000 ft. is found the Cloudberry (*Rubus Chamamorus*). The bulk of the herbage is made up of Flying Bent, Stool Bent, and the Hair grasses. Draw-moss (Sheathing Cottonsedge) is abundant here and there, and Wire Bent is found to a slightly lesser extent. The common rush shows up in the wetter places. Bracken is present, densely covering a considerable area, and is spreading. The remainder of the plants indicated in Col. 1 are found in smaller amounts; of these, Crested Dog's Tail, Sheep's Fescue, Yorkshire Fog, Sweet Vernal and Annual Meadow Grass are most in evidence.

The list in Col. 1 was made during a walk over the Rigg, and some plants may have been overlooked, although a careful search was made for clover. None was observed. There is clover about half a mile away, where lime was applied fifteen or twenty years ago. As will appear below, clover has been developed in very considerable quantity on the thirteen acres of the Rigg which have been improved by heavy stocking. On similar moors in Northumberland, at about the same altitude, occasional clover plants are found, small and starved, appearing to be almost unequal to the struggle against the "fog."

Col. 2 gives the names of the plants which appear on the improved area. From a considerable distance away the plot stands out sharply defined from the surrounding Rigg, by reason of its fresh, green appearance. In July, when the botanical survey was undertaken, the contrast which this plot made against the brownish hue of the untreated moor was very noticeable. On entering the enclosure the abundance of wild white clover is most striking. This plant is making vigorous growth on almost all parts of the area, even pushing its way through clumps of Tussock where, in places, the vigour of this coarse grass has been

\* "The Natural and Artificial Food of Scotch Hill Sheep." *Trans. H. & A. S.*, 1884.

checked by the cattle trampling on the Tussock or feeding on the young shoots. There are, indeed, few places where no clover is to be found, and patches consisting almost exclusively of this plant, covering several square yards, are not uncommon. Of grasses, Sheep's and Hard Fescue, Fiorin and Yorkshire Fog are the most abundant, while the Tufted and Wavy Hair-grasses are also present in some quantity here as on the untreated ground. Crested Dog's Tail is not very prominent. There is little Wire Bent, and the Flying Bent, so common on the surrounding Rigg, is here entirely absent (see Col. 2). Heath Rush (Stool Bent) is also absent, and while there is a fair amount of the common rush, this plant is practically confined to a somewhat wet corner of the plot. Bracken is creeping in from the surrounding Rigg at the eastern end of the enclosure. Creeping Buttercup and Creeping Thistle are somewhat conspicuous weeds over a large part of the area, and to a less extent the Stinging Nettle. Only one specimen of Dandelion was observed, while Cuckoo Flower and Self-heal were not numerous. It is worthy of notice that among the plants established on the enclosure there are several weeds which are not recorded as being found on the Rigg. These appear to stand no chance of growing where the Flying Bent is present.

No seeds were sown on the improved area, and the plants found on this land either survived the process of improvement, or their seeds were carried by natural agents. Some years ago, Alderman Dobson fenced off thirteen acres of the Rigg. A portion of this was tile-drained owing to its wetness, and the open "sheep drains" were filled in to allow the use of the mowing machine. Many stones were removed. Live stock was barred out in May, and in August or September as much as possible of the enclosure (of "Bent" grasses) was mown. The two latter months constitute the usual time of year for winning "Bent" hay. The hay was stacked on the plot.

During the next winter some twenty two-year-old Galloway cattle were kept in the field, in which there is a small spring. Earthenware troughs were set down some distance from each other, and cotton cake was fed to the animals in the morning, and "Bent" hay morning and evening. The ground was heavily trampled around the troughs and in places where the hay had been scattered. The winter rains helped the treading of the cattle by destroying the surface covering of coarse plants and matted roots. From time to time the cake troughs were moved to fresh positions, and by March or April considerable

areas had been trampled almost black, with much dung on the surface. These portions were heavily chain-harrowed with a Parmiter harrow, which levelled them and spread the manure.

In the following summer another crop of Bent hay was stacked in a different part of the field, and the process was repeated for several years, until, when the whole of the enclosure had come under treatment, a dressing of lime was applied. As a result the Flying Bent was destroyed and the "fog" disappeared. On a soil somewhat peaty in character a new herbage has arisen. The enclosure looks a veritable oasis, especially at those seasons when the moor beyond its fences turns brown and later greyish-white, due to the dominant *Molinia*. At a modest estimate the value of the field for grazing, acre for acre, is five or six times that of the surrounding Rigg. Improvement of a further area on these lines is being contemplated by the present tenant of Tarn House, and the method has been followed on other moorland in Northumberland.

When Dr. William Somerville, now Professor of Rural Economy in the University of Oxford; was Professor at Armstrong College, he attempted some experiments at Tarn House in the manuring of rough moorland. Ten plots, of  $\frac{1}{4}$ th acre each, were laid out and dressed in 1895 with nitrate of soda, slag, superphosphate and kainit, applied separately and in various combinations. The plots were at an elevation of 800 feet and the "fog" was thick. The figures of cost of treatment for the period show a range of from 8s. 9d. an acre where nitrate of soda alone was used, to 16s. 9d. an acre where lime dust was applied together with slag and kainit. The reports were not encouraging, although small amounts of the dressings were applied annually for several years. It was observed that where kainit had been used, stock had eaten the herbage on the plot, probably because of the salt ingredients in the manure. In addition slag and kainit had caused an increased yield of herbage. By 1897, however, the effect of the manures was scarcely observable. Mr. Dobson, the tenant of Tarn House, states that when the plots were finally inspected no improvement of any kind was visible. The reason given by Professor Somerville was that the artificial manures had not been able to reach the soil, but were held up by the thick, matted, spongy covering of roots which overlaid it, and made manurial treatment of no avail. It was only by drastic and costly methods that any permanent improvement could be effected.

TABLE showing Plants present on Unimproved and Improved Moorland. Plants present indicated by a X.

	Col. 1. Unimproved Moorland.	Col. 2. Improved Moorland.
<i>Ranunculus repens.</i>		X
<i>Cardamine pratensis.</i>		X
<i>Polygala vulgaris.</i>	X	
<i>Potentilla Tormentilla.</i>	X	X
<i>Stellaria media.</i>		X
<i>Cerastium triviale.</i>	X	X
<i>Trifolium repens.</i>		X
<i>Gallium saxatile.</i>	X	X
<i>Taraxacum officinale.</i>		X
<i>Cnicus lanceolatus.</i>	X	X
<i>Cnicus arvensis.</i>		X
<i>Erica tetralix.</i>	X	
<i>Calluna vulgaris.</i>	X	
<i>Vaccinium Myrtillus.</i>	X	
<i>Veronica Chamædrys.</i>		X
<i>Prunella vulgaris.</i>		X
<i>Myosotis arvensis.</i>		X
<i>Rumex Acetos.</i>		X
<i>Urtica dioica.</i>		X
<i>Juncus communis.</i>	X	X
<i>Juncus articulatus.</i>	X	
<i>Juncus squarrosus.</i>	X	X
<i>Lucula campestris.</i>	X	
<i>Eriophorum vaginatum.</i>	X	
<i>Anthoxanthum odoratum.</i>	X	X
<i>Nardus stricta.</i>	X	X
<i>Agrostis alba.</i>	X	X
<i>Holcus lanatus.</i>	X	X
<i>Festuca ovina.</i>	X	X
<i>Festuca duriuscula.</i>		X
<i>Aira caespitosa.</i>	X	X
<i>Aira flexuosa.</i>	X	X
<i>Cynosurus cristatus.</i>	X	X
<i>Molinia caerulea.</i>	X	
<i>Poa trivialis.</i>		X
<i>Poa annua.</i>	X	X
<i>Pteris aquilina.</i>	X	X
Creeping Buttercup.		X
Cuckoo Flower.		X
Milkwort.	X	
Tormentil.	X	X
Chickweed.		X
Monse-eared Chickweed.	X	X
Wild White Clover.		X
Heath Bedstraw.	X	X
Dandelion.		X
Spear Thistle.	X	X
Creeping Thistle.		X
Cross-leaved Heath.	X	
Ling, or Common Heather.	X	
Bilberry.	X	
Speedwell.		X
Self-heal.		X
Field Forget-me-not.		X
Sour Dock.		X
Stinging Nettle.		X
Common Rush.	X	X
Spret.	X	
Stool Bent.	X	
Field Woodrush.	X	X
Draw-moss.	X	
Sweet Vernal.	X	X
Wire Bent.	X	X
Fiorin.	X	X
Yorkshire Fog.	X	X
Sheep's Fescue.	X	X
Hard Fescue.		X
Tussock.	X	X
Wavy Hair-grass.	X	X
Crested Dog's Tail.	X	X
Flying Bent.	X	
Rough-stalked Meadow-Grass.		X
Annual Meadow-Grass.	X	X
Bracken.	X	X

Note.—As it was found impossible to make a percentage analysis of the herbage on the moor which would be sufficiently accurate, none was attempted of that on the improved enclosure. The text indicates, however, the extent to which the plants were found on both areas.

## THE REVIVAL OF THE SUSSEX TABLE POULTRY INDUSTRY.

J. W. HURST.

THE Sussex table poultry industry has been centred in and around the two districts of Heathfield and Uckfield, in the Eastern division of the county, since a period long before the construction of the London, Brighton and South Coast Railway, when a service of four-horse wagons regularly carried the fattened fowls to the London market three times a week. During its long history this localised branch of poultry production developed along with it other various minor industries, notably a specialised form of milling oats and the making of appliances peculiar to the exercise of the craft.

In the result, in pre-war days the districts that had in course of time come to depend mainly upon Heathfield and Uckfield stations as the chief centres of departure for the despatch of finished produce owed a good proportion of their prosperity to the flourishing condition of this industry. In a very considerable number of cases whole families found in this work their sole means of earning a livelihood, while a much larger number were enabled to add very materially to an income derived from other sources.

Apart from those engaged in fattening, as a distinct and separate occupation yielding a very satisfactory income of itself, others of those who benefited included a large class of farmers, small holders and cottagers who reared the birds for fattening; the higglers and collectors, employed by the fatteners or working independently; the skilled assistants engaged by the bigger fatteners; and the many cottage women who were enabled to earn from 10s. a week upwards by plucking and stubbing the dead birds on marketing days. Further, in the principal complementary industries many more were regularly employed in the manufacture of the back and other collecting crates, fattening coops, and marketing "pads," as well as in making the machines used in the cramming of the birds.

The development of the distinctive milling process has resulted in the building up of a big industry for the supply of Sussex ground oats, the demand for which has become in recent years very general throughout the whole of Great Britain. Neither must it be forgotten that the present day remarkable, but well deserved, popularity of Sussex fowls among poultry keepers of all

classes has been built up upon the broadly selective work of the breeders, who for many generations had been maintaining a distinctive type of bird especially suited to the requirements of the Sussex table poultry industry.

It is worthy of note, moreover, that the beneficial influences of this localised industry had, before the War, extended not only to other English counties but more especially to Ireland and Wales, whence the fatteners of East Sussex drew considerable and regular supplies of lean live chickens to supplement the large numbers reared in and around the home districts, to enable them to maintain both output and employment.

Such, in brief, was the general condition of affairs in this industry before the War. Some idea of the extent of the operations may be conveyed by reference to a few statistical records.

**Statistical Records.**—In 1895 the Royal Commission on Agriculture issued a report by an Assistant Commissioner (Mr. (now Sir) R. Henry Rew) on "The Poultry Rearing and Fattening Industry of the Heathfield District of Sussex."\* The area dealt with comprised the parishes of Rotherfield, Buxted, Mayfield, Uckfield, Heathfield, Burwash, Brightling, Framfield, Waldron, Dallington, East Hoathley, Warbleton, Chiddingfold, Hellingly, and Ashburnham; the trade lying within an easy radius of Heathfield and Uckfield railway stations, from whence the bulk of the produce was (and has been since) sent to London, the former station receiving at that time about five-sixths of the total quantity.

The report states that in the year 1893 the total quantity of dead poultry sent from both stations amounted to 1,840 tons; or, assuming the average weight to have been 4 lb. per bird, a total of more than one million (1,030,400) chickens.

According to information given to the writer by the Railway Company and the local carriers, and recorded in the issue of this *Journal* for March, 1906, the output had at that period increased by some 360 tons; in other words, 200,000 more chickens were being handled per annum than twelve years earlier.

With regard to the inward traffic, in the year 1893 there arrived at Heathfield from Ireland 1,014 "tops" or crates of 50 chickens each, or a total of 50,700 birds; but in the one month of March in 1904, no less than 863 tops were received at that one station. At the latter period (September, 1903 to October, 1904) there were received at Uckfield 18,576 lean chickens from Ireland and 20,804 from Wales.

\*C—7623.



To come down to more recent times, the following figures which the Railway Company have lately placed at the writer's disposal will enable some estimate to be formed as to the extent to which the trade has been affected as a result of war conditions.

**Before and After the War.**—The following quantities of dead poultry have been despatched from the principal stations in the fattening districts :—

1913	...	...	...	...	1,770 tons to London.
1919	...	...	...	...	45½ " " "

The following quantities of lean live birds have been received at the principal stations in the fattening districts :—

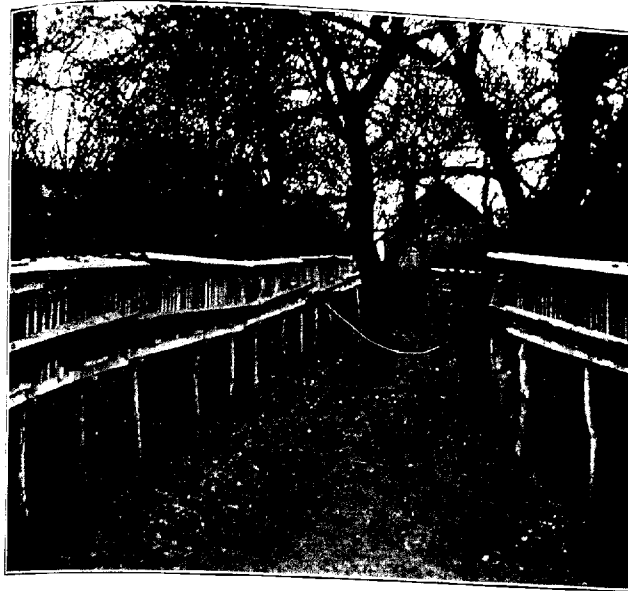
1913	...	...	...	...	700 tons from Ireland.
1919	...	...	...	...	20 " " "

Although these figures do not include returns from all possible centres of departure and arrival, and so cannot (on account of more modern developments and extensions) be compared accurately with those given earlier in this article, they are sufficiently indicative of the disastrous effects of war-time conditions upon this previously flourishing industry.\* During the progress of hostilities not only was the economy of fattening called into question, but the withdrawal of skilled labour and the impossibility of obtaining supplies of suitable feeding stuffs resulted in the general suspension of operations throughout the districts.

The extent of the commencement of the revival as indicated by the 1919 figures has been increased in some measure during 1920, but progress is still very slow. Some of the older fatteners who were forced to close down will probably never make another start. Some of the younger skilled operators will never return, and those who remain are seriously hindered by the high cost of feeding stuffs of the required quality, the increased cost of appliances and of carriage, the inadequate supply of locally reared chickens, the interference with the cross-channel traffic, the rise in wages, and other difficulties only fully appreciated by those who were familiar with the conditions that previously prevailed in this industry.

**Food and Freight.**—As is perhaps generally well known, the best quality table chickens for which the Sussex producers have been so long noted have been largely reared on Sussex ground oats, and fattened on a mixture of the same meal with fat and milk. Sussex ground oats are a product of the mills of this and

\*It is also to be noted that none of the figures quoted include consignments of the finished product to south coast seaside resorts or destinations other than London.



1.—Fattening Coops in the Open (showing the food troughs suspended in front).



2.—Killing day at a Sussex Fatteners (showing plucking and stabbing, and manner of shaping the birds in a press).



the neighbouring county of Kent, being stone ground, and the stones specially dressed in accordance with a particular method. This product of the local mills is weighed as 30 lb. per bushel in the Heathfield district and as 32 lb. in the Uckfield district.

The pre-war price of the Sussex ground oats ranged from £8 to £9 or £10 per ton, and the price to-day varies from £26 to £30 per ton according to the quality of oats obtainable and the district to which the meal is to be delivered.

The prices of appliances of all sorts also show a considerable advance, and freight charges are much higher. The following figures have been supplied to the writer by the Railway Company :—

Charges for carriage of dead poultry from the principal stations serving the chicken fattening districts :—

1913	...	...	1/6	per cwt. to London.
1919	...	...	1/7	" "
Sept., 1920	...	...	2/9	" "

Charges for carriage of lean live birds from Ireland to East Sussex :—

1913	...	...	6/10½	per cwt.
Aug., 1920	...	...	8/11	" "
Sept., 1920	...	...	12/6	" "

It will be noted, of course, that in the case of the Irish chickens (when obtainable) the double freight and increase has to be borne by the finished product.

**Local Opinions on Prospects.**—An extended personal inquiry throughout the districts mainly concerned reveals the existence of some difference of opinion regarding the prospects of progress in the attempted revival of the industry.

A few cases may be mentioned. Of two of the most important firms of millers engaged in the production of Sussex ground oats on an extensive scale, and consequently in a favourable position to gauge the trend of events in this industry, one states that the recent demand from rearers outside the locality (throughout the country generally) has increased considerably, and that within the past few months orders from local fatteners indicate a much more rapid progress than has previously been made since fighting ceased. The other firm, writing in reference to another division of the locality, states that some fatteners have re-commenced on a minor scale, and adds that "it will be several years before anything approaching a pre-war industry will resume, and in future we are of opinion that the industry will be divided among many more people than of yore, and will be treated more as a side line."

A fatterer whose output before the War was among the largest in the trade fears that there is not much prospect of improvement while the cost of production remains at its present level, but that under more normal conditions "there is no reason why fattening on a large scale should not work again." He suggests that there is plenty of room for the breeding of birds that will market in good meaty condition without full fattening, and urges the encouragement of "the breeding of good Light or Red Sussex birds to get the stock up in the country"—this in view of the increase of laying stock and the consequent bigger proportion of cockerels that are quite unsuitable for preparation for table purposes.

Again, a local appliance maker who supplies the fatteners reports a recent activity; "many fatteners," he says, "are recommencing in a small way, and they are quite hopeful of another year seeing the fattening industry back a good way towards its former position."

**Suggested Possibilities.**—As a result of direct personal observation and investigation in the Sussex districts the writer is of opinion that there exists a good workable nucleus of both skilled labour and plant for further development, but that progress is likely to be very gradual. It may, perhaps, be doubted whether there is any possibility of the full recovery of the industry in the more immediate future, in the form in which it existed previously. It is more probable that there will be eventually a somewhat smaller trade of the highly specialized description, so far as concerns full fattening, but that as regards the industry as a whole it should be possible, with a reasonable amount of encouragement, to effect a much more general and widespread extension in a modified form. This should certainly be possible within the county itself, and it is all to the good that at the training centres for ex-service men conducted by the East Sussex Agricultural Education Authority the principles and practice of this branch of poultry keeping are being taught. Such instruction should in any case enable a proportion of the new settlers on the land to participate in the revival of the industry in whatever direction development is found to be most economical, in view of changed conditions and values.

It may be found suitable to encourage the reproduction of this industry in a modified form in other centres, outside the county of its origin, but in this event it would be desirable to commence operations in connection with groups of small

occupiers (working together under some simple form of co-operation) favourably situated as regards the availability of supplies of suitable feeding stuffs, and having easy and relatively cheap access to remunerative markets. Whatever course may be followed, however, the relative economy of the various possible methods of producing table poultry would need to be determined by practical tests undertaken by a competent authority.

**Need for Feeding Tests.**—Conditions have changed so materially since the War, and values are now so different, that any attempts to encourage the revival or extension of such an industry should be guided by the availability of further and more accurate knowledge respecting the relative economy of the different methods of dealing with chickens for the table intended for market. The methods of rearing generally followed in the industry are:—

1. Killing the birds off the run when in suitable condition.
2. Subjecting them to a period (say three weeks) of special feeding before killing, in the confinement of a small run.
3. Cooping them for ten days or a fortnight and feeding on fattening food mixtures given in troughs.
4. Trough feeding, followed by a further period of machine cramming—the full process of the pre-war Sussex industry.

This test should preferably be carried out in the home of the industry and under the conditions that prevail there, and the breeds or varieties best suited to the different methods should be indicated.\*

Until the light of actual accurate experiment, under present-day conditions, is thrown upon this subject in its several aspects, no very satisfactory solution of the problems that confront those previously or now engaged in the industry can be suggested, while the more inexperienced and prospective producers are hopelessly bewildered by the existing lack of reliable information.

---

\* A test on very similar lines has now been arranged by the Agricultural Education Committee of the East Sussex County Council, with the approval and support of the Ministry.

## WOMEN'S INSTITUTES AND AGRICULTURAL EDUCATION.\*

PERCY G. DALLINGER, O.B.E., B.A.,

*Chief Education Inspector, Ministry of Agriculture  
and Fisheries.*

THERE is no means by which co-operation between Women's Institutes and the Ministry of Agriculture can be more effectually secured than by the Officers in each Women's Institute keeping in close touch with the Committee responsible for agricultural education in the county and with the county staff. Where an Agricultural Organiser is appointed, his assistance and advice should be sought on any question connected with agricultural education in the county. If the Women's Institute is satisfied that there is a need for instruction which is not provided, or, if provided, is not within reach of the members of the Institute, this should be brought to the Organiser's notice in the first instance. He may be compelled to say that his staff at that time is unable to undertake additional work, but he is not likely to refuse a reasonable request.

This means can be effectively used not only for securing what is available, but for securing what may be found to be important for further development. If a Women's Institute in a county submitted a considered scheme for the improvement of agricultural education in its district to the Local Authority through the Agricultural Organiser it would very likely receive support. It is suggested that in framing such a scheme the Agricultural Organiser be consulted and that his criticism be invited.

No one who has studied the Women's Institute movement can doubt that it can secure means for its ends, provided that those ends are clearly stated, and that as a preliminary every advantage is taken of the existing machinery. It is true that in some counties the present staff is inadequate; that in all, the staff is busily engaged and it may not be possible to accede immediately to a request for help. Spasmodic requests are the most difficult to meet; a steady demand cannot be ignored.

If Women's Institutes will inform themselves fully of the work of the Agricultural Staff in the County and keep in close touch with the work of agricultural education, they will find that attention will be given to any reasonable proposals they may make for

\* Abstract of a lecture delivered to the Women's Institute Section, Farnham Club, on Monday, 8th November, 1920.

further help. In this connection attention may be called to the Report of the Sub-Committee appointed to consider the Employment of Women in Agriculture in England and Wales, which was completed at the end of last year.\* On page 109 of that Report the Committee makes certain recommendations with regard to the education of women in agriculture. The following may be quoted :—

- (1) That the curriculum of Farm Institutes should provide special domestic-economy classes dealing mainly with labour-saving methods and the use and preservation of home-grown produce ; and that, in those areas where the system of domestic farm servants exists, the Farm Institutes should organise local demonstration classes and simple trials on the above subjects.
- (2) That a number of scholarships for the best of the farm servants themselves should be established at the Farm Institutes for the counties in which farm servants are numerous.
- (3) That all measures for the simplification and acceleration of methods of working in the home and byres should be considered by those responsible for agricultural education and manual training in the local areas.
- (4) That Women's Institutes should develop as fully as possible the experiments they have begun in organising demonstrations in labour-saving methods and in the various branches of household economy ; and that local Education Authorities should give them every facility for classes in connection with these subjects.
- (5) That Women's Institutes should endeavour to extend their organisation as widely as possible amongst wives of farmers and small holders and amongst farm servants.
- (6) That demonstration centres should be established in market-gardening districts in which smallholders are numerous ; and that instruction in all kinds of skilled work in connection with fruit be provided for women.

It would be of great assistance if Women's Institutes would use their influence to secure the carrying out of these recommendations, where no attempt has yet been made to do so.

In the directions indicated above there is considerable scope for very helpful work by Women's Institutes in furthering the interests of agricultural education. There are, however, other directions in which we may work together more closely.

The Ministry is represented on the Executive Committee of the Federation by Dame Meriel Talbot, who is always willing to bring before the Ministry any suggestions which may aid the movement and which it is within the Ministry's province to adopt.

\* See this *Journal*, February, 1920, p. 1123.



The Ministry has lately increased the educational Inspectorate and has appointed a woman with high educational qualifications and considerable experience of organisation. It is hoped that this Inspector may be invited to visit Women's Institutes when carrying out her other duties in the county and to consult with the officers. This arrangement would probably prove helpful both to the Women's Institutes, the Local Authority and the Ministry.

The Ministry has during the past few years devoted considerable attention to the preservation of fruit and the drying of vegetables. A special Committee was set up for the purpose of organising experimental work, and temporary premises were acquired for the preliminary operations with the help of a grant from the Development Fund. The results have, in the opinion of the Ministry, justified a continuance of the work under more suitable conditions, and a factory has been acquired at Chipping Campden in Gloucestershire.

The equipment of the factory is now nearing completion, and it will shortly be in full working order. In addition to the experimental work carried on there, provision is made for teaching by a qualified staff. Short courses lasting for a fortnight will be held during the summer and autumn, in which instruction will be given in the best methods of preserving and bottling fruit and vegetables, and a commercial course lasting for three months will also be provided.

Although Women's Institutes can do much to further agricultural education and the work of the Ministry in the directions above indicated, there is something more important still. The War has affected English agriculture no less—probably much more—than other great industries, and future success in any branch of farming will demand a high degree of efficiency in every class of worker engaged in it. To secure this success many things are necessary, but there is none more important, none which is likely to be more fruitful of results, than an earnest belief among young men and women in rural England in the value of knowledge and in the trained capacity to apply it to agriculture.

“Is truth ever barren? Shall we not be able thereby to produce worthy effects, and to endow the life of man with infinite commodities?” If Women's Institutes will direct their influence to encourage the growth of that spirit in the countryside, they will add further distinction to the record of the fine national work they have done already.

## A CAMPAIGN FOR INCREASED WHEAT PRODUCTION.

### IMPROVED VARIETIES AND MANURES.

A CAMPAIGN, designed to secure, by educational methods, increased production of wheat in this country, has been instituted by the Ministry, and a series of addresses has recently been given in connection with this campaign in certain of the midland counties of England, by the Principal of the Harper-Adams Agricultural College (Mr. P. Hedworth Foulkes).

One of the main objects of the campaign is to increase production, and probably this can best be brought about by raising the average yield per acre throughout the country. To do this is readily possible with the extended growing of the new varieties that give a higher yield.

Proof of the value of practical demonstrations has been provided by the Harper-Adams Agricultural College, Newport, Salop, where the growing of modern improved varieties of wheat has been carried on for many years. One result is that in the course of two or three seasons, several thousand acres in the surrounding counties were employed for cultivating the variety of wheat which had done best in the College Trials. The increased value was then estimated at a figure ranging from 22s. 6d. to £2 per acre.

The average yield per acre for England and Wales from 1867 to 1871 was 27.3 bushels, whereas from 1915 to 1919 the figure was 30.9 bushels. Some of this increase must be attributed to the new and improved yielding varieties which have been grown during the latter period.

For the purpose of comparison the following results of the last three years' Trials at the College are useful. They demonstrate clearly that the average yield per acre for the country could be raised materially by the adoption of one or other of the newer varieties.

<i>Name of Variety.</i>	<i>Yield per Acre in Bushels.</i>			<i>Average.</i>
	1917.	1918.	1919.	
Scalof Iron ... ..	53	61	54	56
Fenman... ..	—	54	50	52
Marshal Foch ... ..	—	55	48	51½
Fox ... ..	—	50	52	51
Victor ... ..	48	47	52½	49½
Browick ... ..	46½	55	48	49½
Yeoman ... ..	42	54	47	48
Square Heads Master ...	46	46	34	42
Standard ... ..	—	—	33	33

Our old-time boast that the average yield for this country was higher than that of any other country in the world is no longer true, for in 1919 this country fell considerably behind both Denmark and Holland. The following are some significant averages of last year's production:—

Denmark ... ..	47·5 bushels per acre
Netherlands ... ..	37·2   "   "   "
Great Britain ... ..	29·1   "   "   "
United States ... ..	12·5   "   "   "
India ... ..	12·6   "   "   "

The new conditions are likely to offer extended scope for the use of manures. Even at present prices an increased yield of 8 bushels repays amply the application of 1 cwt. of sulphate of ammonia.

Judicious manuring is one of the surest aids to increased output, and the result of experiments on the time of application should prove of value to those who are prepared to depart from the older customs of limiting themselves to the employment of farmyard manure on the clover root.

As the result of three years' experiences with the sulphate of ammonia, applied in the College Trials at fixed times of the year, it has been shown that though this fertiliser increased the yield when applied in the autumn, the maximum increase—8 bushels per acre—was obtained by an application at the end of February or in early March.

The danger of over-manuring need not be a deterrent, as there are varieties of wheat available which are strong enough in the straw to carry the resulting large head and big berry. Such varieties as Svalof Iron and Yeoman are very different in this regard from the older Standard Red.

The time of sowing raises an important question. There is the choice of two seasons—autumn or spring, but all available results of experiment bear out the contention that the early sown grain does better. In the College Trials in 1917/1918 the yields were:—

<i>Time of Sowing.</i>	<i>Yield per Acre.</i>	
	<i>Corn.</i> bush.	<i>Straw.</i> cwt.
30th September ... ..	34	43
13th October ... ..	30	39
6th November ... ..	20	36
20th November ... ..	Crop a failure.	

Considering the present price of seed, much remains to be done in checking the present annual waste. The reduction of a half to three-quarter bushel of seed per acre over the country would mean a saving of £1,000,000 per annum.

The value of moderate seeding was demonstrated in a series of Trials at Newport in 1913 and 1914, when the following results were obtained :—

<i>Rate of Sowing.</i>	<i>Yield, 1913.</i>		<i>Yield, 1914.</i>	
	<i>Grain.</i> bush.	<i>Straw.</i> cwt.	<i>Grain.</i> bush.	<i>Straw.</i> cwt.
2 bushels per acre ...	45	41	47	47
2½ " " " ...	43	40	47	45
2½ " " " ...	46	42	47	49
2¾ " " " ...	46	48	42	48
3 " " " ...	38	47	35	43

(Sown 15th and 17th October. Variety, Browick).

There are many other points worthy of the consideration of the wheat grower, for the crop is in most parts not only a safer one to grow than oats, but it will also compare well with barley. In the Midlands oats are becoming increasingly difficult to grow owing to the repeated attacks of the Frit Fly.

## THE DISTRIBUTION OF WART DISEASE.\*

H. V. TAYLOR, M.B.E., A.R.C.Sc., B.Sc.,

*Deputy Controller of Horticulture, Ministry of Agriculture  
and Fisheries.*

*In the first and second parts of this article, published in the November and December issues of this JOURNAL, an account was given of the possible origin of Wart Disease in this country, the earliest traces of the disease in this country, its spread in recent years and influence on the varieties grown, and the incidence of transport and distribution on the spread of the disease.*

**Control of the Disease, and Immune Varieties.**—When the economic importance of Wart Disease became apparent in 1907, it was necessary to establish trials of potatoes for the purpose of investigating the disease, the manner in which potatoes were attacked, and to discover, if possible, measures of control. Much success has already been achieved, but the trials generally have shown an amazing ignorance of the whole matter, especially of the subjects of soil sterilisation, and the accurate life history of the organism.

When the life history of the disease was being investigated, it was established that the fungus was in the nature of a soil organism, and it became necessary to discover means whereby the spores of the fungus could be killed, and the soil sterilised and made suitable once more for the production of clean crops.

Malthouse, Snell, and others have attempted such research, but their investigations have met with no measure of success. In another direction fruitful results have followed from Mr. Gough's investigation of the disease for the Ministry in Cheshire, when clean crops of Snowdrop, Conquest, and other varieties growing in infected soil, were noted; in the following year he stated that Snowdrop, Conquest, Golden Wonder, and Langworthy were immune, or practically so.

About this time the disease, which was causing considerable damage to the farm crops in Lancashire, Cheshire, &c., aroused alarm amongst all potato growers. It was apparent

\* Report of a paper read before the British Association for the Advancement of Science, at Cardiff, on 24th August, 1920.

that there was need for experimental work to find some means of helping the farmer to combat this newly-added difficulty.

In 1909 the Ministry (then the Board) of Agriculture asked the Lancashire County Council, the Harper Adams Agricultural College, and the Holmes Chapel Agricultural College to arrange a series of trials of potatoes on infected land in their counties.

Three sets of trials were arranged by the Lancashire County Council, and one each by the two Colleges. In Lancashire two of the trials were on infected fields, viz., one near Ormskirk, and one near Manchester, while the third trial was carried out in the grounds of the Ormskirk Workhouse, which even then were badly infected. In Shropshire a number of adjoining infected gardens were selected, and in Cheshire one badly infected field.

All the trials were instituted by the Ministry of Agriculture, and were consequently carried out on similar lines. Their purpose was to obtain information in two directions:—

- (a) The possibility of a remedy by sterilizing infected soil.
- (b) The immunity of different kinds of potatoes.

Negative results were obtained under (a), but the trials under (b) showed that of the commoner varieties of potatoes then cultivated the majority were susceptible, but that a few, viz., Langworthy, Golden Wonder, Abundance, Conquest and Snowdrop, remained clean, even though grown in infected soil.

In the following year, the immunity experiments were enlarged, so as to include other varieties not previously tested. The results obtained showed that those kinds previously tested (in 1909) had remained immune, and in addition Aberlady Early, Favourite, Supreme, Crofter, Laird, Provost, and White City were not infected.

This establishment of the immunity of certain varieties of potato from Wart Disease was of the greatest importance to the potato-growing industry, and to the Ministry of Agriculture in its attempt to control the disease.

The county trials, having served a useful purpose, were discontinued, but Mr. Malthouse, of Harper Adams College, assisted by Sir Beville Stanier and by a grant from the Ministry, instituted further trials between 1911 and 1914.

The result of these trials was that the list of immune varieties was extended by the addition in 1911 of the following varieties:—

Crimson Kidney, Early Favourite, Empire, Goodfellow, Invincible, Monarch, New Provider, Redskin Flourball, Snowball, Stourbridge Glory, Wordsley Pride, Improved Kidney, The Admiral, Leinster Wonder (an Irish potato), and five French varieties.

As a result of the trials in 1912 and 1913, the following twenty-seven varieties were also proved immune :—

*Early*.—Peerless Rose, Field Ashleaf, A.1, Gelly's Early, Juni, and North Pole.

*Second Early*.—King George V, Entente Cordiale, Seedling B4, Weltwunder, Table King, and Adirondack.

*Main Crop*.—The Lochar, Great Scot, Culdees Castle, Irish Queen, St. Malo Kidney, Dalmeny Sun, Flourball, Variety unnamed (Ministry of Agriculture), Alice, Callico, Unique, General Kuroki, Brocken, General Nodzu, and Borderer.

There were thus after 1913 about fifty-three varieties of potatoes of importance known to be immune.

**The Ormskirk Trials.**—By 1914 the disease, which had greatly increased in the South Lancashire area, was so destructive to the potato crop in the fields, that the late Mr. John Snell, then Inspector for the Ministry of Agriculture in charge of the Northern district, commenced trials in what may be termed the great potato-growing area of the North of England.

With the support of the Lancashire farmers and a few of the Scotch seed potato growers, Mr. John Snell in 1915 commenced trials on the land kindly lent for the purpose by the Guardians of the Poor Law Institution. The course pursued was :—

1. To test all the varieties of potatoes in commerce in this country in order to discover which were immune from Wart Disease.
2. To demonstrate the disastrous results of planting non-immune varieties on land infected with Wart Disease.
3. To record accurate characteristics of individual varieties.
4. To classify varieties to types.
5. To discourage the use of synonyms.
6. To encourage the raising of new varieties.
7. To discover a means of sterilising infected soil.

**Number of Varieties tested.**—It was seldom that any potatoes were purchased for planting in the trials. All persons were invited to send seed of any kind, and the way in which the trade generally took advantage of this invitation is shown by the following figures :—

1915	there were	94	varieties tested.
1916	" "	159	" "
1917	" "	140	" "
1918	" "	301	" "
1919	" "	472	varieties and 839 seedlings.

The report of each year's trials separated varieties into three groups, viz. (1) Immune Varieties; (2) Non-immune Varieties; and (3) Varieties of doubtful Immunity.

In the first group were placed all varieties on which no Wart Disease had been seen, and in the second were placed all those potatoes found to be affected with Wart Disease in varying degrees of intensity. Where Wart Disease was found on the haulm or tuber, or both, of one or two plants, and it was not possible to determine that the affected plants were "rogues," the varieties were, for the time being, regarded as of doubtful immunity. The tubers from the doubtful plants were destroyed, and those from disease-free plants were saved and tested in the following season; *e.g.*, in 1915, Ally and Edzell Blue were both classed as of doubtful immunity. After selection and on retesting in 1916 both proved to be immune, showing that the plants affected with disease in 1915 were "rogues," *i.e.*, plants of some other variety.

As a result of Mr. Snell's work in testing the large number of varieties and seedlings dealt with, the list of varieties proved to be immune from the disease was raised from 55 in 1914 to 130 in 1919.

**Susceptible Varieties and Infected Land.**—In order to demonstrate to the many potato growers visiting the trials the futility of planting susceptible varieties in infected land, Mr. Snell planted plots of susceptible varieties in some of the infected land. Generally, Cumberland Ideal, Arran Chief, President, Up-to-Date, King Edward, and British Queen were used. On clean land these are heavy croppers, but on infected land the crops were greatly reduced; *e.g.*, in 1918, three plots were planted with Cumberland Ideal, with the following result:—

No.	Clean Tubers per Acre.			Warted Tubers per Acre.			Total Crop per Acre.	
	Tons.	Cwt.		Tons.	Cwt.		Tons.	Cwt.
1	1	11	.....	3	18	.....	5	9
2	1	7	.....	3	15	.....	5	2
3	1	13	.....	3	11	.....	5	4

The average crop of clean tubers was only 30 cwt. to the acre, whereas that of Great Scot or Ally in the same year at the trials gave average crops, respectively, of 13 tons 17 cwt. and 13 tons 12 cwt. per acre.



On clean land neither of these varieties would prove superior croppers to the susceptible kinds. The great loss of crop which must be attributed to the ravages of Wart Disease is a serious matter to the farmer.

**Conditions influencing Intensity of Disease.**—For several years there has been a general belief that the intensity of the disease was greatly increased during periods of excessive rainfall, but until 1919 no actual figures were available to confirm this belief. Previously, many of the highly susceptible varieties produced crops of warted tubers far in excess of the clean crop, but in 1919 the intensity of the disease was so slight that in all cases the reverse held good. In view of the fact that there was no rain in 1919 from mid-April until the 29th June, and, in fact, very little during the summer, it appears highly probable that the *lack of moisture* was the essential factor lessening the *intensity* of attack.

The following figures taken from Mr. Snell's report illustrate this point :—

Variety.	Clean Tubers.				Warted Tubers.			
	Tons.	Cwt.			Tons.	Cwt.		
1918 Cumberland Ideal ...	1	11	.....		3	18		
1919 „ „ ...	1	13	.....		—	19		
1918 Arran Chief ...	2	5	.....		5	12		
1919 „ „ ...	5	—	.....		—	15		
1917 General ...	4	15	.....		4	19		
1919 „ „ ...	3	5	.....		4	11		

Where a variety usually gave a greater proportion of clean tubers than warted, the weight of the latter was much less than in previous years.

Year.	Variety.	Clean Tubers.				Warted Tubers.			
		Tons.	Cwt.			Tons.	Cwt.		
1918 .....	Epicure .....	6	15	.....		1	12		
1919 .....	„ .....	3	17	.....		—	3		
1919 .....	„ .....	3	16	.....		—	1		

A point of considerable scientific interest, and one which Mr. Snell had hoped to investigate, is that the proportion of clean to warted tubers varies considerably with the variety. This conclusion has been arrived at after four years' work, and in 1919 it was hoped to travel further along this line of investigation, but the dry season rendered all observations almost worthless. In order to illustrate the point, a table of figures obtained in 1918, of varieties of certain types, with the weights of clean and warted tubers is given :—

Variety.	Clean Tubers per Acre.		Warted Tubers per Acre.	
	Tons.	Cwt.	Tons.	Cwt.
Cumberland Ideal ...	1	11	3	18
" " ...	1	7	3	15
" " ...	1	13	3	11
Proportion ...	1 clean		2.5 warted.	
<i>President type—</i>				
President ...	5	10	3	6
Scottish Farmer ...	5	11	3	1
Iron Duke ...	4	12	3	11
Proportion ...	1 clean		.66 warted.	
<i>Up to-Date type—</i>				
Prosperity (No. 1) ...	8	3	5	10
Rentpayer ...	7	6	4	18
Proportion ...	1 clean		.7 warted.	
<i>Arran Chief type—</i>				
Arran Chief ...	2	5	5	12
Prosperity (No. 2) ...	3	9	5	4
Proportion ...	1 clean		2.7 warted.	

**Recording of Characteristics of Potatoes.**—Every variety sent in to be tested was carefully studied throughout the season, and the following facts were noted:—the colour of the haulm, the presence or absence of bronzing and of wings on the haulm, the type of wing, the colour of the leaves and flower, the colour and shape of the anthers, the presence or absence of pollen, the approximate proportion of fertile to sterile pollen grains, the shape of the tubers, the shape, depth, position and number of eyes, the colour and texture of flesh, the colour of sprout at time of planting, keeping and cooking qualities, resistance to blight, and degree of susceptibility to Wart Disease. A few illustrations will show the practical value of this work. Let us take the two varieties Arran Chief and Great Scot, which appear to cause considerable confusion, and about which it is important that growers and merchants should be very clear, as Arran Chief is very susceptible to Wart Disease.

(1) Arran Chief has an upright habit, the upper leaves are erect and slightly mottled, the foliage is medium green; the haulm is bronzed and the wings are goffered; the flower is white, and the calyx has a band of yellowish green round it. The tubers are somewhat difficult to distinguish from Great Scot, but at time of planting the sprouts are dark purple.

(2) Great Scot has also an upright habit, but the leaves are inclined to be repand, they are dark green in colour and have no mottling; the haulm is also bronzed, but the wings are knife-edged; the flower is white, but it is not such a free flowering variety as Arran Chief; the calyx is bronzed, and does not possess the band of lighter colour; the sprouts are pale pink at the time of planting.

There is need from many standpoints for the careful recording of detailed characteristics of all plants, and especially so for a plant of the economic importance of the potato.

Practical growers, breeders, raisers and research workers may, in the past, have lacked help in not possessing some standard work of reference to guide them as to the trueness of varieties. In the five years during which Mr. John Snell worked, he dealt with, and made careful records of, some 500 varieties, and his work will be appreciated by, and be of use to, many. This work is of particular value to potato breeders, for varieties giving fertile pollen are essential to them.

This part of the work is still in its infancy, but some useful information has been obtained. It has been shown that certain varieties, such as Ally and Up-to-Date, have no fertile pollen, and in the case of Ally, malformed anthers is an accompanying factor. Such varieties would be useless as male parents for crossing. A knowledge of these facts is useful in analysing stated pedigrees of new varieties or seedlings. In 1918, two seedlings were sent to Ormskirk to be tested. The parents of one were said to be Up-to-Date and Duchess of Cornwall, of the other, Up-to-Date and Factor. Duchess of Cornwall and Factor are synonymous with Up-to-Date. At Ormskirk no Up-to-Date has been grown which produces fertile pollen.

**Types and Synonyms.**—After carefully recording detailed characteristics of such a large number of varieties, most workers on plants would naturally be struck by the remarkable similarity of certain kinds, which in some cases was so close as to suggest synonymous varieties. Mr. Snell has classified the different varieties into types or groups, and has examined the reasons why in some cases two or more names have been given to the same variety. Among the causes are:—

(1) Old varieties have been renamed for trade purposes.

(2) New names have been given to selections from older varieties, as, for example, where a stock of Up-to-Date has shown signs of deterioration. The grower has perhaps sent a supply of the variety to Scotland to be grown there for

several years, and, when it has been regenerated, has put it on the market under another name. That this must have been done very frequently is obvious, as the number of varieties assigned to the Up-to-Date type is up to the present well over twenty.

(3) Occasionally, promising "rogues" are noted and selected from a field of another variety. These may have been propagated, named, and placed on the market.

(4) Synonymous varieties occasionally arise through a stock of a new seedling coming on to the market through two distinct channels. A very good example of this is Tinwald Perfection and Rob Roy. These varieties are identical, but the latter was part of a stock of Tinwald which had been overlooked by the raiser and was sold to Mr. McAlister, who placed it on the market under the name of Rob Roy, not knowing that it was already there as Tinwald Perfection.

(5) Seedlings may arise which are identical in every respect with older varieties or with other seedlings, and there is positive proof of this, *e.g.*, Mr. McKelvie, of Arran Comrade fame, had, among a batch of seedlings, one identical with Up-to-Date. Mr. Cuthbertson has had from seedballs of Myatt's Ashleaf, seedlings identical with Snowdrop and Duke of York. Mr. Malthouse sent a seedling to Ormskirk last year which he called "Salopian," which is identical with broad-leaved Ashleaf. Although seedlings similar to older varieties do arise, we do not know with what frequency.

That there was a great deal of unreliable information connected with this subject, Snell was well aware. Unnamed seedlings have been sent to Ormskirk to be tested; these were assigned to the Arran Chief type. Yet the parents of one were said to be British Queen and Abundance, and the parents of the other were not known; it was a seedling from a chance "seedball of President." It does not seem possible that two seedlings botanically identical with each other and with Arran Chief could have been produced from parents so widely divergent in character.

Again, seedlings identical with Up-to-Date have been produced by crossing British Queen with Kerr's Pink, and Up-to-Date with Factor, and yet it is known that the last-named produces no fertile pollen. Up to the end of the 1919 trials, Mr. Snell had noted 38 types, the most important of which are British Queens, King Edward, Up-to-Date, Abundance and Sharpe's Express types. It is interesting to note that the newer immune types contain very few varieties.

(Concluded.)

## THE INSPECTION OF POTATO CROPS DURING 1920.

### MEASURES FOR THE CONTROL OF DISEASE IN POTATOES.

It need hardly be stated that considerable improvement may be effected in the quality of future crops if care is taken in the preparation and production of seed. This is very evident in the case of the potato, which in England is grown chiefly for consumption and only secondarily for "seed" purposes. For consumption purposes it matters little if a small proportion of the plants ("rogues") are of a different variety from the bulk, but if a crop is grown for "seed," the presence of "rogues" may be of serious consequence. This is especially the case with crops of immune varieties, where the presence of "rogues" susceptible to Wart Disease may mean a lessened crop and lead to a great increase of this dangerous pest. In order to remove the risk as far as possible, the Ministry, in connection with its policy of only allowing the entry of immune varieties of potatoes into Infected Areas, has established a system of crop inspection by which certificates may be obtained by growers, free of cost, if after examination their crops are found true to type and free from "rogues." At present only certified immune "seed" potatoes are allowed entry into the Infected Areas, and to comply with this regulation both the Board of Agriculture for Scotland and the Department of Agriculture and Technical Instruction for Ireland have undertaken the inspection of crops and the issue of certificates in their respective countries.

In England the inspection is carried out by the Inspectors of the Horticulture Division, who are experienced in the identification of the different varieties of potatoes. The inspection in England this year began early in July, and continued until about the end of September, when the haulms were still recognisable.

Last year some 650 applications for the inspection of approximately 6,500 acres were received, but this acreage was greatly increased during the present season, no less than 11,664 acres being inspected in England alone. The number of applications for inspection was 1,221. Of the whole area inspected 10,532 acres were certified and 1,132 acres were rejected for various reasons. As was to be expected, the bulk of the applications for inspection were received from the northern counties, princi-

pally Lancashire, Lincolnshire and Yorkshire, but a considerable acreage in Cambridgeshire, Cheshire, Cumberland, Shropshire and Staffordshire was inspected. The following table gives the figures for the chief potato growing counties. They relate only to the northern and midland counties, as farmers in the south rarely grow potatoes for "seed," and hence do not apply for inspection of their crops. The rarer varieties are not included in this return.

County.	Acreage.	
	Passed.	Rejected.
Cambridge ... ..	278	29
Cheshire ... ..	215	2
Cumberland ... ..	858	37
Lancashire ... ..	3,526	453
Lincolnshire ... ..	1,423	72
Shropshire ... ..	1,090	171
Staffordshire ... ..	947	225
Yorkshire ... ..	610	48

The most popular variety was "Great Scot," of which nearly 3,000 acres were certified, and approximately one-tenth of the crops grown rejected. This was more than twice the acreage of Ally, which was the next popular variety. Some 1,294 acres of this variety were passed, but one-quarter of the acreage inspected (438 acres) was rejected owing to the great prevalence of "rogues." Most of the rejected crops had been produced from Scottish seed certified in Scotland the previous season.

When Ally was introduced to the potato industry it possessed great cropping capacity, and now that the quality and many other favourable characteristics have improved, it is likely to be increasingly grown for seed, if growers take sufficient care to raise and maintain pure stocks. The varieties Majestic, King George and Kerr's Pink were next in importance, the acreage inspected being 1,384, 1,382, and 1,284 acres respectively.

The total acreage in respect of the chief varieties for England and Wales grown during 1920 was as follows:—

	Acreage inspected.	
	Passed.	Rejected.
Ally ... ..	1,294	438
Arran Comrade ... ..	522	7½
Dargill Early ... ..	135	2½
Edzell Blue ... ..	120½	½
Golden Wonder ... ..	51	5½
Great Scot ... ..	3,004	292
Kerr's Pink ... ..	1,254½	30½
King George ... ..	1,233½	149
Lochar ... ..	548½	32½
Majestic ... ..	1,271½	113½
Templar ... ..	498	39
Tinwald Perfection ... ..	351½	10½
Witch Hill ... ..	33	¾

Up to the present the chief concern of the Inspectors has been to see that "rogues" were absent, or, if present, were removed before the crop is certified. Little more has been done except to note the presence of diseases, but in the case of inheritable diseases such as Leaf Curl, if the disease was present to any extent, the Inspector has persuaded the grower to dispose of the crop for ware purposes, and not to sell for seed. Very few crops have been rejected on account of disease alone.

**Diseases.**—*Blight*.—Blight was the most prominent disease found on inspected crops. It started early in some parts of Lincolnshire, making proper inspection rather difficult, and it was necessary for the Inspectors to concentrate on this area so as to finish their work before the haulms had been destroyed. Elsewhere, although present, the blight did not spread to the same extent, and the Inspectors were able to finish their work before the haulms had died down.

*Leaf Curl*.—This disease is responsible for very seriously lowering the potato yield in many parts of the country, and as it is perpetuated from season to season by means of the "seed" it is extremely important to eliminate it as far as possible from crops intended for "seed" and from the "seed" growing areas. Leaf Curl has been much investigated of late and it has been proved to be not only inheritable, but infectious (see Leaflet No. 164). It is common all over England, but its attacks are more severe in the south. During the inspection some bad cases were noted, and, as already mentioned, the grower was persuaded to use his crop for ware purposes. In other cases, where it was less abundant, a selection from the best parts of the field was advocated. In certain areas cases were noted in which curling of the foliage occurred which was not referable to true Leaf Curl. The most striking were those where fields had been partially or entirely flooded in spring, the plants on the flooded areas showing a curling of the foliage which was absent on the partially flooded areas.

*Mosaic*.—The mottling due to Mosaic is seen very generally and clearly in the varieties Golden Wonder, Langworthy, Burnhouse Beauty and Tinwald Perfection, especially early in the season and in the cooler districts. It is also known in many other varieties, but to a lesser extent. Mosaic disease, which is known to reduce the yield very seriously in many counties, is receiving close attention by the Ministry's experts.

*Blackleg*.—This disease has been noted in most districts, but usually only in a small quantity. In most instances the plants affected had probably died down before the land was visited. No variety seems to be immune.

**" Rogues."**—" Rogues," i.e., potatoes of a variety foreign to that planted, may be due to either self sets, e.g., plants which have been produced from tubers left from previous crops, or from tubers introduced with the seed. Owing probably to mild winters, the self sets have been rather more prominent, especially on land where potatoes come frequently in the rotation. The following are the common " rogues " in the chief varieties:—

<i>Variety.</i>	<i>Chief Rogues.</i>
Edzell-Blue ...	Lord Tennyson, Rule Britannia, Forty Fold (Immune).
Arran Comrade ...	Generally very free. Ally "rogue" found.
Ally ...	Arran Beauty (a British Queen), Up-to-Date, President, and a pink-eyed round, probably, Marquis of Bute.
Great Scot ...	Arran Chief, British Queen, Abundance, Templar, Lochar and Date, President.
Kerr's Pink ...	King Edward: usually very free from "rogues."
Tinwald Perfection ...	Up-to-Date.
Lochar ...	Usually very free. British Queen and Up-to-Date found.
Majestic ...	British Queen and K. of K. most frequently met; also cases where King Edward has appeared. King Edward and Great Scot.
Bishop ...	Up to-Date.
Templar ...	Usually very pure; occasionally a "Date" rogue
Arran Victory ...	Occasionally an Edzell Blue.
King George ...	Rogues very variable. British Queen, Ally, Date, President, Eclipse, Lothair, and Great Scot.
Langworthy type ...	Usually Up-to-Date.
Abundance type ...	British Queen, King George and Ally.

The list of growers whose stocks of potatoes have been certified as true to the variety stated and of the recognised standard of purity is now ready. Copies may be obtained from the Offices of the Ministry, 3, St. James's Square, London, S.W.1. price 2s. post free.



## POTATO GROWING.

**Potato Demonstration Plots, 1921.**—In view of the importance of the potato crop on both farms and allotment gardens, it is desirable that potato growers should be able to obtain adequate and reliable information on all matters relating to potato culture, many phases of which may best be brought to their notice through the medium of demonstration plots. Further, the spread of Wart Disease throughout the country, and its effects on the potato crop, render it important that the qualities of the most promising of the varieties which are immune from this disease should be demonstrated to growers. The Ministry, therefore, suggests that potato demonstration plots should be set up throughout the country in 1921 for the purpose of ascertaining those immune varieties best suited to different districts, and also to demonstrate the approved methods of potato culture. County authorities responsible for horticultural education have accordingly been asked to institute demonstration plots in the different districts within their area on the lines stated below.

*Varieties.*—It is proposed that the trials in 1921 should be divided into two main sections:—(1) trials of first early varieties; and (2) trials of second early and main crop varieties. The second early and main crop varieties chosen for demonstration are:—Ally, Arran Comrade, Early Market, Great Scot, King George, Kerr's Pink, Lochar, Majestic and Tinwald Perfection.

*Supply of Seed.*—It has been decided for various reasons that it would be advisable to obtain all the seed used in these demonstrations from the same source, and the Ministry has accordingly made arrangements with a Scottish seed potato merchant to reserve a quantity of seed potatoes of the trial varieties for planting in the demonstration plots in 1921.

*Quantity of Seed.*—28 lb. of each of the above varieties will be planted on land which has been prepared according to the instructions given below.

*Manures.*—The land should receive a dressing of farmyard manure at the rate of 15-20 tons per acre, applied in the drills at the time of planting. Artificial manures should also be applied, on dates to be recorded, in quantities somewhat as follows:—

Superphosphate (26 per cent.)	-	-	-	4½ cwt. per acre
Sulphate of Ammonia	-	-	-	1 cwt. per acre
Sulphate of Potash	-	-	-	1 cwt. per acre

These suggestions may require modification according to local customs and conditions.

*Planting.*—The time of planting will vary slightly according to the district. It is also suggested that a distance of 30 in. between the drills, and 12 in. between the sets, should be maintained throughout all the trials.

**Imported Seed Potatoes from Scotland.**—The Ministry of Agriculture and Fisheries has recently issued an Order, under the title "Wart Disease of Potatoes (Imported Scottish Seed Potatoes) Order of 1920," which is of importance to all potato growers and merchants who obtain seed potatoes direct from Scotland.

The main provision of the Order is that any importer who receives from Scotland "seed" potatoes which are not accompanied by the necessary declaration (as set out below) shall report the fact to the Ministry within seven days of the receipt of the potatoes.

The declaration required is:—

- (1) In every case of a consignment of any seed potatoes, other than certified stocks of immune varieties, a declaration correctly stating the reference number of the certificate issued by the Board of Agriculture for Scotland to the effect that wart disease has not existed on, nor within one mile of the place in which the potatoes were grown.
- (2) In the case of certified stocks of approved immune varieties, a declaration stating correctly the serial number of the certificate of purity issued in respect of the growing crop.

## MANURES IN JANUARY.

E. J. RUSSELL, D.Sc., F.R.S.,  
*Rothamsted Experimental Station, Harpenden.*

**The Proper Time for Top Dressings.**—Many inquiries are made as to the proper time for applying top dressings to farm crops. The general rules are as follows:—

**GRASS LAND.**—*Any time in autumn or winter:* lime, chalk, basic slag kainit (on hay land).

*Spring:* superphosphate, sulphate of ammonia, nitrate of soda, nitrate of lime, nitrolim (the latter four on hay land).

**ARABLE LAND.**—*Winter corn, at time of sowing seed:* superphosphate, basic slag, kainit, sulphate of potash, muriate of potash.

*Spring:* sulphate of ammonia, nitrolim, as early top dressings; nitrate of soda, nitrate of lime, as later top dressings.

**ROOTS.**—*Autumn: on stubble of preceding crop:* lime or chalk; farmyard manure in eastern and southern parts of the country.

*Spring, at time of sowing seed:* superphosphate, kainit, sulphate of potash, muriate of potash, sulphate of ammonia, nitrolim; and, on mangolds, salt.

*Time of singling:* nitrate of soda, nitrate of lime, salt (to mangolds). In the case of swedes it is often not advantageous to give top dressings of artificials in addition to dung: mangolds, however, do take considerable quantities.

**SEEDS LEY.**—*Autumn:* lime, chalk, basic slag.—*Spring:* liquid manure if available; nitrate of soda or sulphate of ammonia if necessary to encourage grass on mixed leys where clovers are failing.

### What Crops are Benefitted by Chalking or Liming?

Assuming that lime or chalk is available, what will be the best way of applying it? If the land is thoroughly sour all crops benefit. If it has not been allowed to get into such condition and is only beginning to suffer from lime shortage, then the crop that derives most benefit is clover; swedes and barley also benefit; wheat and oats derive no benefit except in bad cases. After an improved clover crop, however, the subsequent cereal crops usually benefit, while there is often the additional advantage in the ease of working the land and a reduction of costs, matters which are of importance to the farmer.

Some of the results obtained at Rothamsted are:—

<i>Land chalked in 1913.</i>				<i>Uchelle</i>	
<i>Chalked.</i>					
<i>26 loads fine. 50 loads lump.</i>					
1914.	Oats, grain ...	<i>bush.</i>	37.3	41.1	4
1915.	Clover, hay ...	<i>cwt.</i>	35.8	39.2	11
1916.	Wheat, grain ...	<i>bush.</i>	33.8	30.2	3
	straw ...	<i>cwt.</i>	40.3	35.0	3
1917.	Oats, grain ...	<i>bush.</i>	29.7	27.1	2
	straw ...	<i>cwt.</i>	22.8	22.9	2

The variations on the unchalked plots are characteristic of land beginning to show signs of sourness.

**Comparison of Organic and Ordinary Artificial Manures.**—

Reference has several times been made in these notes to the fact that organic manures are not worth a specially high price to the ordinary arable farmer, although they may have particular value to the gardener and the market gardener because of their convenience in handling and the fact that they are fool proof.

A similar conclusion is arrived at by Dr. J. G. Lipman and A. W. Blair, of the New Jersey Experimental Station, whose results are so important that they deserve full consideration. The results are as follows, worked out on the basis of 1/20-acre plot :—

Plot.	Dressing.	Increase over Control for 5 years, 1913-17.			
		Unlimed.		Limed.	
		Total Grain.	Hay, Straw, Stalks, &c.	Total Grain.	Hay, Straw, Stalks, &c.
9	Nitrate of soda ... ..	1,917	7,622	1,097	4,710
10	Nitrate of lime ... ..	1,262	7,107	2,057	6,955
11	Sulphate of ammonia ... ..	1,232	3,367	2,192	7,020
12	Nitrolim ... ..	1,522	4,532	1,667	4,675
13	Dried blood ... ..	1,157	4,637	1,747	4,505
14	Fish ... ..	1,557	5,847	1,572	3,660
15	Tankage ... ..	1,242	3,777	1,492	3,275
5	Cow manure ... ..	2,592	10,332	1,237	5,505
6	Horse manure ... ..	2,662	11,837	1,332	5,875
8	Nitrate of soda (half dressing)	547	2,667	1,322	2,440

The quantities of the various fertilisers on Plots 9-15 contained the same amount of nitrogen, equal to 320 lb. nitrate of soda per acre. Horse and cow manure were supplied at heavier rates, viz., 32,000 lb., or nearly 15 tons, per acre.

Taking the average of the organic manures and of the artificials the results work out as follows :—

	Average Yield of Dry Matter.				Percentage Nitrogen recovered.			
	Unlimed.		Limed.		Unlimed.		Limed.	
	1908-12	1913-17	1908-12	1913-17	1908-12	1913-17	1908-12	1913-17
	lb.	lb.	lb.	lb.	Per cent.	Per cent.	Per cent.	Per cent.
Average of 4 artificials—								
Grain ... ..	6,002	3,651	6,380	4,211	40.1	29.4	49	33.3
Straw, &c. ... ..	14,686	11,715	15,535	13,280				
Average of 3 organic manures—								
Grain ... ..	5,608	3,467	6,075	4,662	27.3	24	29	27.1
Straw, &c. ... ..	13,608	10,812	12,597	11,283				

A similar long series of experiments carried out at Ohio under Director C. E. Thorne has been summarised. The results for the 16 years 1903-18 are as follows:—

Crop.		Nitrate of Soda.	Sulphate of Ammonia.	Tankage.	Nitrate of Potash.
		Plot 8.	Unlimed Land.	Plot 18.	Plot 22.
Tobacco	(lb.)	1,227	1,095	960	1,131
Wheat	(bush.)	26.63	25.82	26.16	25.15
Clover	(lb.)	4,416	4,149	4,360	3,987
Annual Values*		\$93.82	\$85.79	\$79.97	\$86.61

		Limed Land.		
		Plot 26.	Plot 28.	Plot 29.
Tobacco	(lb.)	1,069	1,082	959
Wheat	(bush.)	27.78	28.05	23.96
Clover	(lb.)	4,139	4,193	2,054
Annual Values		\$85.77	\$86.78	\$77.44

Again, nitrate of soda proves superior on the unlimed land, but the superiority disappears when the land is limed. Artificial fertilisers prove more effective than the organic manures.

**Manuring in Glass Houses.**—It is not the purpose of this section to deal with glass houses, but two important principles brought out may be mentioned. Nitrogenous manures encourage development of the leaf and stem, but not always of the fruit. At the Experimental Station at Cheshunt it was found that there was more fruit when nitrogen fertilisers were omitted than when they were supplied. The soil in this case is not far removed from a virgin loam and is still rich in nitrogen, but the general lesson of the experiment is that nitrogen fertilisers, while they caused increase in growth, did not increase, but actually decreased, the fruit. With tomatoes of the Comet variety the results were:—

	Lb. per Plant.				Tons per Acre.				Relative Weights Acre 1916-19.
	1916.	1917.	1918.	1919.	1916.	1917.	1918.	1919.	
Complete artificials ..	4.9	5.11	3.82	5.57	33.7	35.8	25.8	42.2	1.6
No nitrogen ... ..	5.7	5.80	3.62	5.98	45.0	39.2	28.2	47.4	1.1

The second important point is that potassium compounds increase the vigour of the plants and enable them more readily to resist disease; this is generally known to many growers. Flax growers in the North of Ireland have found that potassic ferti-

\* Rating tobacco at 15 cents per lb.; wheat at \$2.00 per bush.; and hay at \$20.00 per ton.

lisers increase the resistance of the plant to the attacks of the wilt organism.

At the Cheshunt Experimental Station liberal treatment with potassic fertilisers makes the tomato plant more resistant to the bacterial stripe disease: the numbers of plants affected out of a total of 120 in each plot were\* :—

Variety.	Complete Fertiliser.	No Potassic Fertiliser.
Comet ... ..	40	78
Kondine Red ... ..	13	38

Potassic fertilisers often afford the simplest method of dealing with fungoid diseases, and they are usually more effective than other fertilisers under glass.

**Are Mineral Phosphates Effective as Fertilisers?**—This question is now being asked by a number of farmers, and details of some of the experiments are given from time to time in these notes. Broadly speaking the result at present is : *Where basic slag cannot be obtained in sufficient quantity it is worth while trying mineral phosphates, provided that they are sufficiently finely ground.* Judging from the trials already made there is reason to expect that they will prove useful on heavy clay grazing land where the herbage is in poor condition. They may also prove useful (though the evidence at present is not complete) on arable land for the growth of swedes and turnips. Judging from foreign experience they should also prove useful on sour soils badly deficient in lime.

\* S. G. Paine and F. W. Bewley, *Annals of Applied Biology*, 1919, 6, 185.

## FEEDING STUFFS IN JANUARY.

E. T. HALNAN, M.A.,

*Ministry of Agriculture and Fisheries.*

It will be noted in scanning the table of prices appended that the price per unit of food value of various feeding stuffs differs greatly. It may be as well to consider the causes responsible for these variations.

The guiding principles which govern the price of a feeding stuff (apart from the question of supply and demand) are (1) its food and manurial values, (2) its appearance, (3) convenience of feeding, (4) its dietetic and condimental values, (5) its palatableness, (6) and last, but not least, its wholesomeness.

(1) Full information on the *food value* of the various concentrated feeding stuffs on offer in the markets and the relative money values of the various foods on offer are summed up in the table on p. 965. In the footnote is given a method whereby the farmer may distinguish which of any foods he contemplates purchasing is the cheapest from the food standpoint.

(2) The *appearance* of a food generally weighs much too heavily in the mind of the buyer when making a purchase. A food with a pleasing and attractive appearance often commands a better price owing to this. A case in point is the differential price generally ruling for bran and broad bran. In one instance two earl nut cakes were on offer, with a difference in price per ton of nearly 20s., though the cheaper and less attractive cake was actually of better feeding value than the more attractive and expensive one.

(3) In view of present labour conditions the *convenience of feeding* is an important point that the practical feeder cannot neglect. Cakes are generally much easier to feed than meals, and the feeder must decide for himself how much more per ton he is prepared to pay for this convenience.

(4) The *dietetic value* of a food is an extremely important point of which all feeders are well aware. In fact, it is generally lack of knowledge of this point that makes feeders cling to old-established feeding stuffs and makes them doubtful of using new ones. The result of this is to depress all unfamiliar feeding stuffs below their true market value, and it is in this direction that practical progressive farmers may reap the advantage of low prices. In this connection, wrong feeding often creates an unwarranted prejudice against a feeding stuff. The ancient

NAME.	Price per Qr.		Price per Ton.	Manurial Value per Ton.	Food Value per Ton.	Starch Equiv. per 100 lb.	Price per Unit. Starch Equiv.	Price per lb. Starch Equiv.
	s.	lb.	£ s.	£ s.	£ s.	s.	d.	
Barley, English Feeding	70/-	400	19 12	1 6	18 6	71	5/2	2.77
"    Foreign	62/-	400	17 17	1 6	16 11	71	4/8	2.50
Oats, English	50/-	336	16 13	1 9	15 4	59.5	5/1	2.73
"    Foreign	46/-	320	16 2	1 9	14 13	59.5	4/10	2.59
Maize	56/-	480	13 1	1 5	11 16	81	2/11	1.56
Beans, English spring	90/-	532	18 19	3 1	15 18	66	4/10	2.59
"    "    winter	86/-	532	18 2	3 1	15 1	66	4/7	2.45
"    Chinese	18/-	112	18 0	3 1	14 19	66	4/5	2.28
Peas, English blue	135/-	504	30 0	2 13	27 7	69	7/11	4.24
"    "    dun	85/-	504	18 18	2 13	16 5	69	4/8	2.50
"    "    maple	95/-	504	21 2	2 13	18 9	69	5/4	2.86
"    Japanese	132/6	504	29 9	2 13	26 16	69	7/9	4.15
Buckwheat	84/-	392	24 0	—	—	—	—	—
Rye, English	84/-	480	19 12	1 8	18 4	72	5/1	2.73
Millers' offals—Bran	—	—	13 10	2 10	11 0	45	4/11	2.63
"    Coarse middlings	—	—	14 10	2 10	12 0	64	3/9	2.01
Barley meal	—	—	22 0	1 6	20 14	71	5/10	3.12
Maize	—	—	16 0	1 5	14 15	81	3/8	1.96
Bean	—	—	21 0	3 1	17 19	66	5/5	2.90
Fish	—	—	24 10	7 12	16 18	53	6/3	3.35
Cakes, Linseed	—	—	19 10	3 12	15 18	74	4/2	2.23
"    Soya	—	—	—	5 4	—	69	—	—
"    Cotton seed	—	—	13 0	3 5	9 15	42	4/8	2.50
"    Cotton seed decorticated	—	—	20 0	5 6	14 14	71	4/2	2.23
"    "    decorticated meal	—	—	18 0	5 6	12 14	71	3/7	1.92
Coconut cake	—	—	15 19	3 0	12 19	79	3/3	1.74
Groundnut cake	—	—	15 15	3 9	12 6	57	4/4	2.25
"    decorticated	—	—	18 0	5 5	12 15	73	3/6	1.87
Palm kernel cake	—	—	11 15	2 1	9 11	75	2/7	1.38
"    "    meal	—	—	10 0	2 1	7 19	75	2/1	1.11
Brewers' grains, dry	—	—	10 10	2 7	8 3	49	3/4	1.78
"    "    wet	—	—	1 7	0 12	0 15	15	1/-	0.53
Distillers' "    dry	—	—	11 11	2 16	8 15	57	3/1	1.65
"    "    wet	—	—	1 9	0 13	0 16	16	1/-	0.53
Malt culms	—	—	10 2	3 6	6 16	43	3/1	1.65
Potatoes	—	—	*3 0	0 8	2 12	18	2/11	1.56
Swedes	—	—	*1 4	0 5	0 19	7	2/11	1.56
Mangold	—	—	*1 3	0 6	0 17	6	2/11	1.56

\* Consuming value.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in the larger markets, usually London, and refer to the price ex mill or store. They are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative prices of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, suppose palm kernel cake is offered locally at £15 per ton. Its manurial value is £2 1s. per ton. The food value per ton is therefore £12 19s. per ton. Dividing this figure by 75, the starch equivalent of palm kernel cake as given in the table, the cost per unit of starch equivalent is 3s. 6d. Dividing this again by 22.4, the number of pounds of starch equivalent in 1 unit, the cost per lb. of starch equivalent is 1.88d. A similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own market.



dislike to decorticated cotton cake was undoubtedly due to the fact that, owing to ignorance, too heavy a quantity of this feeding stuff was included in the ration, and digestive troubles resulted.

It might be well to emphasise once more that linseed cake, soya bean cake and bran have a laxative effect, whereas common cotton cake and beans are distinctly binding.

(5) With regard to *palatableness*, too much attention may easily be paid to this point. The eagerness with which stock will consume any given feeding stuff is no true criterion of its feeding value. Stock will consume most feeding stuffs if sufficient attention is paid to method of feeding, and if care is taken to introduce any change in diet gradually.

(6) The question of *wholesomeness* of a feeding stuff is one to which the feeder cannot pay too much attention. Linseed cake, oats and bran at once suggest themselves as suitable feeding stuffs for most purposes. Stock feeders use such feeding stuffs with confidence, but they do not readily use such feeding stuffs as palm kernel cake, sesame cake, and soya bean cake, although these three cakes are quite wholesome if care is taken to feed in judicious quantities. Some feeding stuffs occasionally contain poison, and it is especially necessary to act with caution whenever a new feeding stuff is on trial, or in any case where the cake fed is not in good condition. The golden rule in such a case is to feed first in small quantities and to one animal.

Since last month feeding stuffs have fallen considerably in price. Wet brewers' and distillers' grains still remain the cheapest feeding stuffs, and palm kernel cake and meal and maize are very profitable at present prices.

## NOTES ON POULTRY KEEPING.

**Feeding in January and February.**—The most expensive period of the year for poultry keepers is well advanced, and with the season of maximum egg production approaching, the outlook is still further improved by the prospect of better supplies of feeding-stuffs.

There are now ample supplies of most poultry feeding-stuffs, and although little improvement is apparent in the quality of middlings, much of the bran is better than has been the case for a considerable period.

Maize and its by-products are plentiful. Much of the old prejudice against maize feeding has been broken down, and cracked maize is now more generally used in suitable proportions and is more easily obtained. A warning should be given against damaged samples. These mostly find their way into mixtures, so that particular care should be taken by poultry keepers when purchasing grain mixtures.

The prices at which clover meal is offered are frequently far above its value, and, judging by the poor quality of some samples (many of which are practically valueless for poultry feeding), it is evident that some vendors are taking an unfair advantage of the growing popularity of clover meal as a poultry food.

Purchasers of fish meal should exercise due caution, as although the dangers from the presence of excessive salt have been reduced by frequent warnings, it is still very necessary to watch for the presence of worthless material.

**Breeding Stock.**—Stock should be liberally fed, but it is necessary not to unduly force the birds for eggs. Fish or meat meal should only be used in moderate proportions in the wet or dry mash, and a plentiful supply of vegetables, either cooked or in a raw state, should be allowed. A grain mixture consisting of good heavy oats and about 25 per cent. of maize is suitable for cold weather. Wheat alone, especially if containing much dirt, &c., is not good for winter egg production. Particular care should be taken to ensure that the male birds in breeding pens secure a sufficiency of food, and it is recommended that they should be fed apart from the hens in some instances, as this will amply repay the additional trouble occasioned.

**Laying Stock.**—The disposal by now of all surplus and unprofitable stock will have reduced the laying flocks to suitable

proportions for the accommodation available, and with the exception of the later hatched birds the pullets will be in full lay.

Where dry mash feeding is practised there is less likelihood of the birds being underfed provided the material in the mash is of good quality. Good results in egg production can be secured with either the "wet mash" or "dry mash" system of feeding if properly carried out, but in order to reduce the grain bill the feeding of dry bran in hoppers (constructed to avoid waste) is an economical addition where wet mash feeding is practised. Care must be taken to encourage activity and provide occupation for the birds whatever method of feeding is adopted. In the absence of fresh green food, turnips or swedes can be given. Beetroot and artichokes are also valuable and are greatly appreciated by the birds.

*Chicken Feeding.*—The earlier batches of chickens generally thrive better than the later batches, several factors being responsible for this. More care is taken in the preparation of wet mashes, and these are not given when stale and sour as they frequently are later in the season. Cracked wheat and groats, or coarse oatmeal should form the basis of all dry chicken mixtures. Kibbled maize and canary seed can be added to provide variety, which is an advantage, but the chicks do not always take readily to maize, and canary seed is expensive unless of really good quality. Whilst variety in the food is good this is frequently obtained at the expense of quality, and too much importance should not be attached to it. Mixtures are frequently wasteful and extravagant owing to the poor quality of some of the ingredients. The more general use of Sussex ground oats in a wet or dry mash is to be recommended, especially in view of the poor quality of the middlings. A small proportion of maize meal mixed with the ground oats is an advantage in the preparation of a wet or dry mash. Boiled rice is a valuable food as a safeguard against bowel disorders, from which large numbers of chickens perish, and it is an advantage if the rice is boiled in separated milk. Green food should not be omitted from the diet, and is better if finely chopped for little chicks. In the absence of young fresh green food, or in addition to this, chopped raw onion is a valuable substitute and should be mixed with the mash.

\* \* \* \* \*

**Notes on Essential Points in Poultry Feeding.\***—It is more profitable to maintain a few well-fed birds than a large number

\*This note is also issued as Leaflet No. 321 as recently re-written.

of badly fed birds. Poultry will not give a satisfactory return unless their food is sufficient and of a suitable nature, and is also both varied and palatable.

Poultry require (I) grain, whole or in the form of meals or offals; (II) animal food; (III) green food.

*Grain.*—Oats and maize are among the most suitable grains for poultry under existing food conditions. The former should be of good quality, as light oats are very wasteful. Maize must be used in moderation; it is better cracked; and it is a most valuable food in wet and cold weather when the birds are exposed.

*Meals, Offals, &c.*—Bran and middlings are the staple constituents of dry and wet mashes respectively, and may form up to 50 per cent. by weight of the mash. Sussex ground oats, maize meal, barley meal and palm kernel meal may be used in proportions not exceeding 25 per cent. by weight of the mash. Clover meal of good quality forms a useful substitute if the supply of green food is insufficient, but it is difficult to obtain.

*Animal Food.*—As a rule poultry upon free range will find abundant insect life between March and November. During the remaining months, and at all seasons when not available from natural sources, a moderate proportion of animal food should be provided. Lack of animal food frequently accounts for the absence of eggs from well-developed pullets.

Fresh horse-flesh, meat offals or blood are all of the greatest value if procurable easily, cheaply and regularly, but they should be used in limited quantities. Meat meal and fish meal are the most convenient forms of animal food for the majority of poultry keepers, and are generally more readily obtained. They may be given in amounts not exceeding  $\frac{1}{2}$  oz. per bird daily mixed with all meals.

*Green Food.*—A regular and plentiful supply of fresh vegetable food should be given to birds on limited range. Upon free range there is generally sufficient for their needs, except during the winter months, when waste from the garden, or roots, swedes or mangolds should be supplied.

*Preparation of Wet Mash.*—Meals (including fish and meat meals) should be first scalded with the liquid in which vegetables have been cooked and then allowed to stand for a few minutes. Vegetables and cooked meat should be pulped or finely chopped before being added to the mash. The

middlings should then be well mixed in by hand, until the whole mash is in a dry crumbly condition; the mash should then be fed to the birds while still warm.

Wet mash may be given either as a morning or evening feed and should be fed in troughs to avoid dirt and waste.

*Dry Mash.*—For birds upon a limited range dry mash feeding has much to recommend it. If the mash is given in properly constructed hoppers or troughs there need be little waste, and, by placing it before the birds almost continuously, the birds can secure sufficient food and are at the same time kept busy. The ingredients should be purchased separately and mixed in bulk.

*Grit.*—Grit composed of some hard material, such as flint cracked to the size of peas, is required to assist the fowls to digest their food, and should always be available.

*Shell.*—Either oyster or cockle shell is needed by laying hens to provide material for the formation of egg shells.

*Water.*—Fresh water should always be provided in unlimited quantity.

\* \* \* \* \*

**National Egg-Laying Test at Dodnash Priory.**—The National Utility Poultry Society, in conjunction with the Great Eastern Railway Company, carried out during 1919-20 an egg-laying test at Dodnash Priory, Bentley, near Ipswich, extending over a period of 48 weeks. In all, 280 pens were entered for the competition, and were divided into six sections: (1) White Leghorns; (2) White Wyandottes; (3) Rhode Island Reds; (4) any sitting (other than Wyandottes and R.I. Reds); (5) any non-sitting breed (other than White Leghorns); (6) a championship section for White Leghorns, White Wyandottes, and Light Sussex, limited to breeders who had won one gold or two silver medals in previous tests.

The eggs laid were classified by the Society into two grades: Grade 1, eggs weighing 2 oz. and over; and Grade 2, eggs weighing less than 2 oz. but not less than  $1\frac{5}{8}$  oz. during the first 10 weeks, and for the subsequent period not less than  $1\frac{3}{4}$  oz. For the purposes of the competition, however, not more than 100 second-grade eggs, or in the case of the championship section not more than 200 second-grade eggs, were allowed to be included in the pen score.

The following table shows the egg totals for the test for the whole of the period:—

Egg Totals for the whole period of the Test.

Died during Test.	No. of Birds.	Breed.	Eggs Laid.		Total.	Average Yield per Bird for 12 Months.
			1st.	2nd.		
21	570	White Leghorns	80,572	16,938	97,510	173
23	440	White Wyandottes	48,194	21,711	70,905	162
9	155	Rhode Island Reds	19,696	3,420	23,116	152
4	45	Buff Orpingtons	4,440	2,429	6,869	157
—	5	White Orpingtons	652	98	750	150
3	45	Light Sussex	4,352	863	5,215	118
—	15	Speckled Sussex	1,616	322	1,938	129
1	15	Buff Plymouth Rocks	1,605	413	2,018	135
—	5	Croad Langshans	780	85	865	173
—	55	Anconas	7,789	737	8,526	155
6	65	Black Leghorns	8,757	740	9,497	152
—	5	Black Minorcas	593	87	680	136
—	5	Black La Bresse	614	328	942	188
1	5	White La Bresse	199	687	786	163
—	5	Russian Orloffs	706	7	713	143
—	5	Sicilian Buttercups	512	85	597	120
68	1,440	All the birds	181,377	48,850	230,227	163
		Unrecorded eggs	...	...	1,119	
		Eggs under size (not scored)	...	...	431	
		Total ...	...	...	231,777	

The egg production of the five leading pens in each of the six sections was as stated below. Each pen consisted of five pullets, except in the case of the Championship Section, where there were 10 pullets to the pen :—

Breed.		Average Number of Eggs per Bird.	
1.	White Leghorns	...	208, 205, 203, 198, 195
2.*	White Wyandottes	...	190, 189, 206, 183, 167
3.	Rhode Island Reds	...	205, 194, 175, 173, 183
4.	Sitting Breeds	...	173, 167, 150, 146, 162
5.	Non-sitting Breeds	...	210, 177, 177, 171, 168
6.	Championship—White Leghorns	...	215, 181, 217, 183, 184

\* \* \* \* \*

**World's Poultry Congress.**—Arrangements are sufficiently forward to make public the general arrangements for the first World's Poultry Congress which, by invitation of the Netherlands Government, is to be held at the Hague, Holland, from 6th to 13th September, 1921.

Congress Committees have been formed in the following countries : Belgium, Canada, Czecho-Slovakia, Denmark, France, Great Britain and Ireland, Italy, Norway, Portugal, Sweden and the United States of America.

A preliminary programme will shortly be issued giving details as to arrangements already made, lists of papers to be read, and

information for those who desire to participate in the Congress. Every provision will be made with regard to routes by which the Hague can be reached, special terms at hotels, &c. Copies of the preliminary programme and regulations for Exhibition to be held at the same time, when issued, can be obtained from the Secretaries, British Congress Committee, 3, Vincent Square, London, S.W.1, to whom application for membership should be made.

Papers have been promised by many of the leading authorities in the poultry world, and by scientific investigators in various countries.

All Government Departments concerned in poultry work, Public Authorities and Institutions engaged in poultry instruction or in research and experimental work, poultry and other societies and trading firms or societies may appoint delegates, and private individuals who may wish to become members may do so. A fee of £1, or 12 Dutch guilders, will be charged for each delegate or member, and will entitle the holder to all privileges of the Congress, including a copy of the Report.

It is anticipated that the Demonstration Exhibition will include representative breeds of poultry from nearly all countries throughout the world, displays by educational and scientific institutions, examples of appliances and apparatus used for production, education and commerce, models, books, bulletins, diagrams, photographs, food products, &c. Several Governments have intimated their intention of co-operating in the Exhibition.

## REPAIR AND MAINTENANCE OF THRESHING MACHINES.

DURING and since the War, the state of threshing machinery has considerably deteriorated owing to lack of labour and materials necessary for repairs, and to the fact (due to scarcity and high cost) that only a small number of new machines have come into use.

In view of the great difficulty being experienced by threshing machine proprietors, and more especially the smaller contractors, in procuring efficient men capable of executing repairs necessary to keep existing plant in a proper state of efficiency, the Ministry has thought it desirable to issue a few simple instructions, in the hope that they will prove to be of assistance to those who are not conversant with the essential working parts of a threshing machine.

There are in use to-day many machines which have had from twenty-five to thirty years' wear, but are still in good order—a result entirely due to their having been maintained in efficient condition and worked by careful attendants.

**Suggestions for Threshing Machine Owners.**—The points needing most attention are as follows:—

*Setting.*—It is frequently noticed that machines are set for use without proper regard having been paid to the formation of ground on which the machine stands. All threshing machines are constructed so that the drum runs level, and unless this position obtains, the work suffers in consequence.

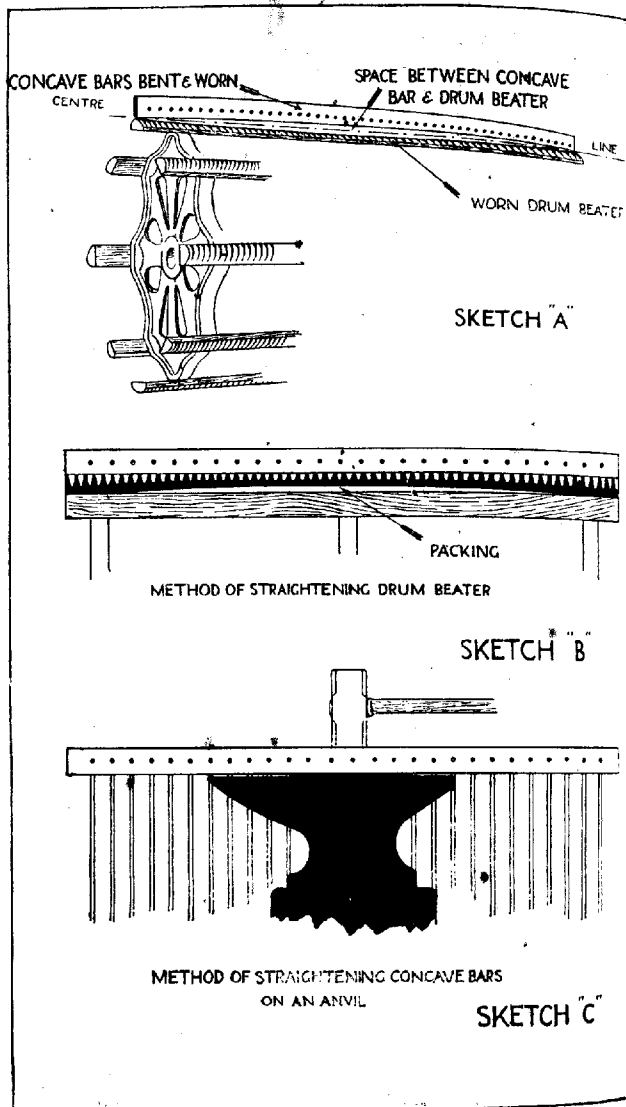
*Drum.*—The beaters of the drum and the bars of the concave have a tendency to wear in the centre and become hollow, thereby making the drum more open at the place where most of the threshing is done, with the result that grain is left in the straw; the drum may also become so close at the ends that the corn is likely to be split (*see Sketch A*). When this occurs it is desirable to take the beaters off and pack them up in the centre with cardboard, or other suitable packing material, until they are again in a straight line (*see Sketch B*). This can be only done once; when worn down a second time they should be replaced by new parts. Spares of this nature should be kept always available.

The drum bearings and spindle should be kept in good condition and the drum properly balanced.

The concave bars have a tendency to get worn off on the top edge, and when this happens the bars should be taken out and turned, thereby bringing the square edge to the top.



Bent bars may be straightened on an anvil, as shown in Sketch C. In modern threshing machines the concaves are



reversible, which exposes the opposite side of the concave bars to wear, but a time will come when the concave wires will have so worn that it is desirable to renew the concave.

*Straw Shakers and Riddle Cranks.*—The bearings of the straw shakers should be adjusted, and attention given to the small cross bars, which are likely to get broken off, thereby increasing the amount of cavings passing through. In old machines shaker blocks are generally of wood, and wear and tear must be taken up and adjusted.

*Riddles and Sieves.*—These should have attention. Care should be taken to see that there are no holes worn in them, and no places where the corn leaks out on the ground. Damage is frequently caused by impatient attendants endeavouring to clear a choked riddle, when in motion, by a thatch pin or any other similar article near to hand.

*Screen.*—The adjustable screen is likely to get out of order through being closed with corn or other matter between the wires; the wires get bent, leaving open spaces and in some cases they become unsoldered from the expanding frame. If the screen is in bad condition it is impossible to get an even sample of corn without an undue proportion of good corn going into the tailings. It is preferable to send it back to the makers to be repaired.

*Straps and Belts.*—All straps and belts should be maintained in good condition and with as few buckles and lacings as possible. \* It is also desirable to see that the shaker and riddle belts are kept fairly tight, otherwise there may be an unobserved loss of efficiency through slipping.

*Self-Feeders.*—Efficient feeders are often difficult to secure, and when this difficulty is experienced, contractors are advised to try self-feeding apparatus, which in some districts is coming into use.

*Engine.*—Owing to the high price of fuel, it is desirable that the steam engine should be maintained so as to give as economical results as possible. If the piston or slide valve is passing steam it should have attention immediately.

Mechanical forced feed oil pumps for lubricating the slide valve and piston are most essential.

The exhaust pipe, when using mineral cylinder oil, is likely to fur up and become contracted. This throttles the exhaust, reduces the power of the engine, and increases steam consumption. It should therefore be kept thoroughly clean.

In districts where bad water prevails, it is desirable that the boiler tubes should be withdrawn at frequent intervals,

as heavy incrustations will increase the consumption of coal as much as 15 to 20 per cent. The smoke tubes should be swept out daily.

The engine governors should be kept in an efficient state of repair. Steady running of the machine results in good threshing. It is a wise precaution to keep a watchful eye on the governor strap. Instances occur of the strap breaking or coming off, allowing the engine to race, thereby wrecking the drum and concave by bursting through centrifugal force.

The most economical method of firing is to keep as thick a fire as the engine will steam with, being careful to fill in with coal any holes which burn through to the firebars. Firebars should be kept in good condition, so as to avoid waste in coal. Warped bars which permit fuel to fall through should be renewed. Steam should be kept as high as possible and the governors set accordingly, thereby ensuring dry steam.

**Suggestions for Farmers.**—Farmers are advised to give attention to the following:—

- (1) Carefully examine the straw by drawing the heads through the fingers to feel if any corn is left in it.
- (2) Examine the corn where the straw empties into the elevator, or on to the ground, to see if any corn is coming off the shaker with the straw.
- (3) Examine the cavings and chaff in a similar manner.
- (4) Attention should also be paid to adjustment of blower in order that seeds of weeds may be blown out. As much blast should be used as possible provided that no corn comes over with the cavings and chaff.
- (5) See that the screen is separating the corn properly and that no good corn is getting into the tail. Also note whether there is an undue amount of broken corn, caused by the drum being set too close. If barley and wheat are both being threshed, and in the latter the chaff adheres to the corn, the awner and piler require careful adjustment. In a dry season barley is often very much deteriorated for malting purposes through the ends being broken off by severe treatment of the awner and when passing through the piler blades. These latter can be regulated easily by the threshing machine man, but in some seasons it is advisable not to allow barley to pass through the awner as maltsters are unanimous that many good samples are ruined through the ends of kernels being bruised. It is preferable to leave a portion of awn on the kernel.

## MOLE DRAINING.

THERE is no doubt whatever as to the value of drainage, especially on heavy land. On land that is badly drained the best type of herbage can never be obtained, while at the same time the grazing season is practically limited to the drier summer months. At other seasons stock cannot be carried on such land without grave risk both of illness and disease to themselves and of lasting damage to the texture of the soil.

In the case of arable land, work is retarded and rendered difficult and expensive. Crops cannot be depended upon. They have frequently to be sown out of season and are apt to fall an easy prey to various pests and diseases.

The present cost of laying down extensive systems of pipe drainage is very high, but on heavy clay soils quite as efficient, if not quite as permanent, drainage can be obtained at relatively little cost by the use of the mole plough. On such land mole drains will last from eight to ten years and under favourable conditions even twice as long. The inclusive cost (about 50s.-65s. per acre) is often fully recovered in the increased crops obtained the first year.

Mole draining is not adapted to every kind of soil, but wherever heavy clay land, to which it is specially adapted, is to be found, it deserves, as one of the cheapest and surest methods of improvement, full and careful trial. On more friable soils mole draining may be successful, but in such cases there must always be a good fall and intermediate main drains should be provided. There should be few, if any, stones so large that they cannot be turned aside by the coulter; and the ground must not be too uneven, as the drain will naturally follow the inequalities of the surface. If the field is laid up in ridges and furrows the drains must follow the line of the furrows and not run across them.

As regards fall, if a field has a sufficient fall on the surface for a water furrow to run, there will be sufficient fall for the proper working of a mole drain. Less fall is required on a heavy plastic clay than on a more friable soil, where water standing in the mole would tend to make the walls fall in.

The mole plough consists of a round steel plug about three inches in diameter attached to the lower end of a strong coulter which is fitted to a suitable frame mounted on wheels. It is worked, like an ordinary steam plough, by cable and winding drum.

There are two methods of proceeding. Either the moles are first run and then the mains are put in, or the mains are first laid and the moles run over them. In either case the work must be carefully planned beforehand.\* If the moles are run first the mains should be laid with as little delay as possible. On lighter land and where the fall is slight it is better to lay the main drains before running the moles, otherwise a heavy shower may ruin the work completely. The advantage of running the moles first is that they can be cleared out with a stick as the mains are dug and a free outlet secured into the main. As a rule pipes are used for the mains and also for the beginning of each mole drain to make a good junction with the main.

Where the slopes drained by the moles are short, the mains may be laid with  $2\frac{1}{2}$ -in. pipes, but where the slopes are longer 3-in. pipes should be used. The longer the slopes and the steeper the fall the more numerous should be the main outlets—at any rate there should always be at least one for every three acres.

The moles are sometimes started from holes, or “eyes,” into which the coulter, with the plug attached, is dropped; but often when the lie of the land and the lay-out of the proposed drains admit it, the mole is allowed to bury itself. If, for instance, the main runs parallel with the side of the field and not less than 14 yds. from it, the mole drain can begin at the surface and will have reached full depth by the time it crosses the line of the main.

The tunnel produced is very similar to a mole’s “run,” and if the subsoil is of the right texture and moistness, an efficient drain is obtained. The disturbance caused by the coulter itself is very small and as a rule the cut soon closes up. Even when a crop is being grown on the land the work may be done without causing any very serious damage, especially if done in dry weather and before the crop is more than a few inches high.

There should be a main drain along the bottom of the field: in the case of an uneven field main drains should be made along the hollows. For cutting the main drains, a drain-cutting machine, such as the Swedish “Revolt” excavator, will save

\* It is a good plan, where mole draining has not been done before, to get a few hints from a steam plough foreman; he will often see reasons for putting in mains which have not occurred to the farmer.

For instance, in planning mains, it is well to know the extreme distance that the engine can cover in one pull. This seldom exceeds 200 yd. Attention to this and like points will often save much labour.

a considerable amount of hand labour. As a temporary measure main drains can be made by the mole plough and connected with a boundary ditch, or the mole drains can be run direct into a ditch. In this case, however, they should be protected, by the insertion of pipes, for two or three feet from the outfall; but it is not advisable to do without a main drain. A number of mole drains running into an open ditch will require more labour to keep clean than is likely to be available, and as some width of headland must generally be left for the engine to stand on, it is not always possible to run the moles direct into a ditch. Where it is desired to save expense, Faggot, or Bush Drains, as described in the Ministry's F.P. Leaflet No. 62, are sometimes used. Sometimes pipe draining is combined with bush draining. The main drain is dug about a foot deeper than the moles are to be driven, and filled in above the pipes with brushwood up to the level of the moles. When this is put in before the moles are drawn it should consist of twigs not more than 1 in. in diameter. The coulter will cut through these quite easily. When considering how deep to set the coulter of the drainer care should be taken to put it at the minimum depth of the mains, as these will of necessity be a few inches shallower in some places than in others.

A main drain should always have a cheap facing of brick or stone round the last pipe. This prevents damage and serves to mark the outfall.

The mole drains are usually made about 2 ft. in depth and about 5 yd. apart. Where the field is laid up in ridges or stitches the distance between the moles is usually determined by the distance between the furrows, but this is not always a certain guide, as the nature and lie of the land may require more drains. In fields where the water percolates to the subsoil very slowly, it is best to put in the mole drains fairly close, say, about 3 yd. apart, and not deeper than about 18 in. or 20 in.

It is most important that a plan of each field should be kept, showing the mains and their shallowest points. Such a plan will be useful in case the field should be moled again.

In Essex, where a good deal of mole drainage is performed annually, it is the custom for the tenant to carry out the work and the landlord to find the pipes for the main drains. In cases where the tenant leaves his farm after doing the work, compensation is generally given on a basis of three to six years.

*(This article is also issued by the Ministry as Leaflet No. 356.)*

## AGRICULTURE ABROAD.

### WOOL AND LEATHER IN CHINA—SEED CLEANING IN FRANCE—PRODUCE ON LARGE AND SMALL HOLDINGS IN RUMANIA.

A Wool and Leather Industries Commission was formally instituted at Peking on 1st June, and the President of the Chinese Republic has appointed Mr. Siung Ship Yi as President.

**Wool and  
Leather Industries  
Commission in  
China.**

The functions of this Commission are, *inter alia*, as follows:—

1. To locate the regions best suited for raising cattle and sheep and to study the present output, quality, demand, and transportation facilities of wool and leather in these regions.

2. To ascertain the quantity and kinds of wool and leather required by foreign countries and to study the world's trade conditions concerning wool and leather.

3. To introduce and to encourage scientific stock raising.

4. To formulate methods of rendering assistance to the people in their enterprises as described in (3).

5. To select and purchase the best domestic and foreign breeds of cattle and sheep, which are to be sold at cost to the breeders.

6. To train technical assistants for cattle and sheep raising and wool and leather making, and also to study the methods of providing for hygienic conditions for domestic animals.

7. To establish breeding farms, wool and leather factories and laboratories, and make a comparative study of the different machinery and equipments used in the wool and leather industries and of the methods of marketing the products.

8. To devise methods of inspecting the quality of wool and leather to be exported.

9. To gather information and to receive reports on wool and leather industries from different provinces; to translate foreign technical books; and to publish magazines and bulletins concerning these industries.

10. To send out from time to time parties of experts to lecture in various cattle and sheep raising districts, in order to accelerate the development of wool and leather industries. The Ministry has forwarded to the Commission particulars of

the various British breeds of live stock and the names of Secretaries of Breed Societies in this country.

\* \* \* \* \*

MENTION has been made at various times in the *Journal d'Agriculture Pratique*, and also recently in the *Comptes Rendus*

**Seed Cleaning  
in France.**

of the French Academy (issue of 14th April, 1920), of methods of cleaning cereals by mechanical operation. It is pointed out that experiment has shown that increased yields may be obtained by sowing seed previously cleaned, and machines have been designed to perform the cleaning process. These machines are well known among the larger farmers, but are little used on small holdings on account of their high price. It is noted that when cleaned cereal seed is sown, the number of weeds in the crop is reduced and increased yields are obtained.

In order to demonstrate the value of the machines used, a travelling seed-cleaning installation, consisting of different types of seed-cleaning machines, lent by the manufacturers of the machines, was recently exhibited on a car provided by the Paris-Orleans Railway, which made an itinerary of the two Departments served by the railway. A programme of the stations to be visited was drawn up, and notices of the stopping places of the car were sent out in advance. Farmers were invited to bring quantities of cereal seed to be cleaned, and many lots were so treated and several machines sold.

Where seed wheat of selected varieties furnished by large firms of seedsmen is not available, it is suggested that wheat of the previous harvest should not be sown "as threshed," but that it should be first properly cleaned.

A case of individual enterprise in the use of seed-cleaning machines is mentioned: A French farmer at Hailly (Oise), mounted a seed-cleaning machine on an ordinary motor waggon, and was thus able to arrange for its conveyance from one farm to another.

In order to a larger extent to remove the difficulty of high cost which has prevented the general adoption of the cleaning machines on small holdings, encouragement has been given to the idea of co-operation. So long as twenty years ago, co-operative use of cleaning machines was tried in the Department of Pas-de-Calais, and in 1908 a co-operative cleaning installation was established at Busy (Doubs). France is largely a country of small holdings, and in the co-operative



system undoubtedly lies a way to the solution to many problems of this nature.

\* \* \* \* \*

It is frequently held that large holdings produce heavier crops than do small holdings, and this opinion appears to be borne out by the statistics of production published in Rumania.

**Comparison of  
Produce on Large  
and Small  
Holdings in  
Rumania.**

Taking the six years before the War (1909-1914) as a period of inquiry, and 100 hectares as the dividing line between large and small holdings, the Rumanian statistics show that the production of the four main cereals—wheat, oats, rye and barley—was greater on the large holdings than on the small holdings. The yields given in each case hereunder are in hectolitres per hectare.\* Thus, in 1910, when the yield of wheat was heaviest for the six years mentioned above, the production on large holdings was 21.6 and on small holdings 18.3. Similarly, by taking the year in which the yield of each of the other cereals was heaviest, the statistics show that oats produced in 1913 on large holdings 27.2, and on small holdings 21.7; the yields for rye in 1910 were 19.3 and 15.3 respectively; while the barley production was in 1910 21.3 on large holdings and 18.0 on small holdings. Again, in considering the years when the yield of each crop was lowest, it is shown that, whilst in 1914 the production of wheat on large holdings was only 9.2, the yield of small holdings dropped to 7.4. Oats in 1909 show a yield of 22.4 for large holdings and 17.0 for small holdings. The figures for rye in 1914 are 9.1 for large holdings and 8.1 for small holdings. Finally, while the yield of barley in 1909 was 14.7 on large holdings, small holdings produced 12.1.

A similar result is obtained if potatoes and roots are added to the scope of the inquiry. The 1913 statistics show the same tendency; crops produced on large holdings are heavier than those produced on small holdings. In view of the splitting up of the large estates in Rumania into peasant holdings, it will be a matter of importance to those countries which have hitherto been receiving the exportable surplus of the Rumanian cereals whether such exportable surplus will be greatly reduced or wiped out, by the loss of production that appears always to occur under small holding management.

---

\*1 hectolitre =  $2\frac{3}{4}$  bushels; 1 hectare =  $2\frac{1}{2}$  acres. To calculate the yield per acre quantities given should therefore be multiplied by 1.1.

**Cost of Production of Winter Milk.**—The experience of the War showed the great need for reliable statistical information as to the cost of production of the principal articles of agricultural produce, and with a view to obtaining such information, the Ministry of Agriculture and the Ministry of Food, early in 1919, set up a Committee, known as the Agricultural Costings Committee, to inquire into the costs and results of the various branches of farming. Among the tasks allotted to the Committee has been an investigation into the cost of milk production throughout Great Britain, which was undertaken at the request of the Food Controller.

The Committee is still engaged in its work, but an Interim Report (Cmd. 1028)\* recently issued in respect of the first period of investigation, viz., 1st October, 1919, to 30th April, 1920.

The Report deals with 165 farms, of an average area of about 250 acres. The average number of cows kept per farm was about 36. In estimating cost of production, purchased foods have been taken at cost prices and home-grown foods at market prices less cost of marketing. It is pointed out that the prices at which home-grown foods are charged have a very important bearing on the figures arrived at.

The charge for wages includes the labour of feeding and attending to cows, both in milk and dry, and other dairy stock, but excludes delivery and retail labour and management charges, manual labour performed by the farmer and his family having being charged at the local rates of wages. Horse labour and labour of carting foods are charged in the costs at a uniform rate of 9d. per hour, while nothing is included in respect of interest on capital, and only £409 2s. 9d. is included for management charges where this sum was actually paid. In considering the margin of profit which should be allowed to the producer, interest on capital and an allowance for management should be kept in mind. The points above mentioned have obviously an important bearing on the interpretation of the figures.

**Weight and Cost of Ration per Cow.**—The following table shows the average ration fed and the average ration cost as between England and Wales and Scotland:—

	Average Weight of Ration per Cow per Day.		Average Cost of Ration per Cow per Day.		Average Cost of Ration per Gallon.	
	England and Wales.	Scotland.	England and Wales.	Scotland.	England and Wales.	Scotland.
	<i>lb.</i>	<i>lb.</i>	<i>pence.</i>	<i>pence.</i>	<i>pence.</i>	<i>pence.</i>
Purchased foods ...	9.9	16.1	14.9	14.9	10.1	9.5
Home-grown foods	53.1	73.1	30.1	25.6	20.1	16.3
Total ...	63.0	89.2	45.0	40.5	30.5	25.8
Grazing ...	—	—	.9	.2	.6	.1
			45.9	40.7	31.1	25.9
					Litter.	Litter.
					.5	.3
					31.6	26.2

The cost in respect of home-grown foods fed to the cows for Great Britain during the period at average market prices works out per gallon of milk produced, as follows:—hay (at £14 6s. 5d. per ton) 7s. 2d., straw (at

\* Obtainable from H. M. Stationery Office, Imperial House, Kingsway, London, W.C.2, price 2d., excluding postage.

£6 13s. 9d. per ton) 4d., roots (at £2 5s. 2d. per ton) 6'25d., and other foods (at £4 7s. 8d. per ton) 1s. 6d. The average total cost per gallon in respect of home-grown foods is therefore 1s. 7d., to which an addition of 0·4 pence should be made for litter.

*Costs of Producing Milk at the Farms.*—The average costs of producing a gallon of milk at the farms, taking into account labour expended on all stock in the herds, food and litter, general expenses, depreciation and maintenance of herds were:—in Great Britain 3s. 5½d., England and Wales 3s. 8d., and Scotland 3s. 0½d. Against these costs, however, must be set credits in the form of manurial values returned to the farm and amounts to be allowed in respect of other dairy stock. The credit figures for Great Britain, England and Wales, and Scotland were respectively 6½d., 6½d. and 6d. Thus the net costs of production for the three areas were:—2s. 11d., 3s. 1½d. and 2s. 6½d.

It will be observed that under the system of calculation adopted by the Committee, the home-grown food used was charged at market prices less cost of marketing. If therefore milk were sold at the prices indicated in the Report as the Cost of Production, the farmer would presumably realise a substantial profit on these home-produced foods.

**Agricultural Research Scholarships.**—The Ministry, on the recommendation of the Advisory Committee on Agricultural Science and with the concurrence of the Development Commissioners, has awarded Research Scholarships in Agricultural Science to the four undermentioned candidates:—

Mr. J. G. H. Frew, B.Sc. (Entomology) (Birmingham University).

Miss M. S. Lacey, B.Sc. (Plant Bacteriology) (Birkbeck College, London University).

Mr. J. C. Mann, B.A. (Animal Nutrition) (Cambridge University).

Mr. J. L. Rosedale, M.A. (Animal Nutrition) (Aberdeen University).

These scholarships, which are of the value of £200 per annum and are tenable for two years at such Institutions at home or abroad as may be approved by Ministry, have been established in order to train promising students—graduates of British Universities with honours in science or equivalent qualifications—with a view to their contributing to the development of agriculture by becoming research workers.

**Tithe Redemption.**—The Ministry of Agriculture and Fisheries gave notice early last month that landowners who proposed to redeem tithe rent-charge under the conditions now in force should lodge their applications for redemption not later than the 1st January, 1921. Owing, however, to the recent rapid and very considerable increase in the number of applications received, it is inevitable that during the next few months some delay must occur in proceeding with the applications.

**Leaflets issued by the Ministry.**—Since the date of the list given on page 890 of last month's issue of this *Journal*, the information contained in the following leaflets has been revised and brought up to date:—

- No. 25.—Chafer Beetles.
- „ 61.—Sheep-Scab.
- „ 142.—Calf Rearing.
- „ 146.—The Value of Records of the Milk Yield of Cows.
- „ 164.—Potato Leaf-Curl.
- „ 264.—The Cultivation of Onions.
- „ 267.—Basic Slag.

- No. 282.—Scheme for the Improvement of Live Stock.  
 „ 296.—Potato Growing in Allotments and Small Gardens.  
 „ 335.—Potash Fertilisers.  
 „ 349.—Methods of Obtaining Strong Stocks of Bees for Over-Wintering.

The following leaflets have been withdrawn from circulation:—

Permanent Series—

- No. 155.—Larch Canker.  
 „ 158.—White-Rot of the Vine.  
 „ 174.—Tree Root-rot.  
 „ 273.—“White-Heads” or “Take-All” of Wheat.

Food Production Series—

- No. 5.—Breaking up Grass Land.  
 „ 13.—Comparative Money Values of Feeding Stuff.  
 „ 23.—Blast Furnace Flue Dust as a Potash Fertiliser.  
 „ 27.—Potash Supplies during the War.

Special Series—

- No. 34.—Autumn and Winter Fodder.  
 „ 60.—The Preparation of Home Made Rennet.  
 „ 76.—Feeding Stuff and Live Stock.

**Approximate Areas of Land at Different Altitudes.**—In response to an enquiry, an approximate calculation has been made by the Ordnance Survey of the area of land in England, Wales and Scotland at different altitudes, after deducting the area of forest land and the area under cultivation.

	Total area.	Area after deducting Forests & Land under Cultivation.
<i>England.</i>	Square miles.	Square miles.
Above 500 and below 750 feet ... ..	5,907	5,607
„ 750 „ „ 1,000 „ ... ..	2,407	2,027
„ 1,000 feet „ ... ..	2,118	1,418
<i>Scotland.</i>		
Above 500 and below 750 feet ... ..	7,448	6,648
„ 750 „ „ 1,000 „ ... ..	3,726	3,026
„ 1,000 feet „ ... ..	6,415	5,415
<i>Wales.</i>		
Above 500 and below 750 feet ... ..	1,706	1,620
„ 750 „ „ 1,000 „ ... ..	853	810
„ 1,000 feet „ ... ..	2,167	2,020

**Rabies.**—*Wiltshire, Dorset and Hants.*—Two extensions of the scheduled district have unfortunately been rendered necessary by the occurrence of outbreaks of Rabies. The first of these was confirmed on the 26th November, on premises at Wimborne. As Wimborne was situated on the borders of the Scheduled District, the District was extended so as to include Bournemouth and the neighbourhood. On the following day, disease was found to exist in a dog which was discovered straying at Compton, near Winchester. Enquiries elicited the fact that the dog had strayed from the premises of its owner in

Southampton and it was considered necessary further to extend the Scheduled District so as to include amongst other places Southampton and Winchester.

Further outbreaks were confirmed on the 7th and 13th December at Ramsbury and Baydon, Wilts, respectively, but neither of these cases necessitated any extension of restrictions.

*Glamorgan*.—A further case of Rabies was confirmed in the Glamorgan Hunt Kennels on the 20th December.

*Berkshire*.—Two outbreaks of Rabies have been confirmed in the borough of Reading on the 11th and 13th December respectively. Reading is in the district subject to the restrictions applicable to another controlled area, and the occurrence of these outbreaks did not necessitate any alteration of the restrictions.

*London District*.—A case of Rabies in a dog at Acton was confirmed on the 8th December. An Order has been made in consequence by the Ministry, requiring :

(a) The muzzling at all times and the leading when in a public place of all dogs in an Inner Controlled Area, and prohibiting entirely the movement of dogs out of this Inner Area.

(b) Prohibiting the movement of dogs out of an Outer Scheduled District surrounding the Inner Area.

Full information was issued to the press on 9th December.

**Foot-and-Mouth Disease.**—*Kent (Faversham District)*.—All restrictions imposed on account of the outbreaks in the Faversham District were removed as from the 6th December.

*Kent (Wingham District)*.—The existence of foot-and-mouth disease was confirmed on premises at Betteshanger on the 30th November, and it was necessary once more to impose the usual restrictions over an area within a radius of 15 miles from the infected premises. Fortunately no spread of the disease occurred, and the Ministry was able to modify the restrictions by the exclusion of a considerable portion of the Scheduled District as from the 7th December.

*Hereford*.—On the 12th December an outbreak of foot-and-mouth disease was confirmed on premises at Mordiford, near Hereford. The circumstances connected with this outbreak were serious, as animals which were recently exposed at Hereford and Shrewsbury Markets were infected. On the 14th December disease was found to exist at Ledbury and Lugwardine, Herefordshire, the origin being directly due to the Mordiford outbreak. Both these places were within the district to which the initial prohibition of movement restrictions were applied on the 12th December.

*Gloucestershire*.—On the 16th December two outbreaks of the disease were confirmed on premises at Woolridge, Hartpur, near Gloucester, in animals which had been, in contact with the affected animals at Ledbury, Herefordshire, where disease was confirmed on the 14th December. These outbreaks necessitated an extension of the Herefordshire Scheduled District.

*Shrewsbury*.—On the 16th December two outbreaks were also confirmed in Salop, one at Myddle, and the other at Basechurch, both near Shrewsbury. In both cases the affected animals had been purchased in Shrewsbury Market on the 10th December and in Hereford Market on the 8th December, and had been in contact with one of the affected animals at Mordiford Farm, Herefordshire. An Order was made prohibiting movement of animals over an area of 15 miles radius from Shrewsbury.

## ADDITIONS TO THE LIBRARY.

## Agriculture, General and Miscellaneous.

*Rothamsted Memoirs on Agricultural Science.*—Vol. ix., 1909—1916. (170 pp.). Harpenden: Rothamsted Experimental Station, 1919, 35s. net. [37(072).]

*National Farmers' Union.*—The Food of the People: The Nation and its greatest Industry. (35 pp.). London: Offices of the Farmers' Union, 1920, 2d. [338.1.]

*Martin, G.*—Animal and Vegetable Oils, Fats and Waxes. (218 pp.). London: Crosby, Lockwood & Son, 1920, 12s. 6d. net. [664.3.]

*Williams-Ellis, C.*—Cottage Building in Cob, Pist, Chalk and Clay. (2nd Ed.), (133 pp.). London: "Country Life" Offices, 1920, 7s. 6d. net. [69(05).]

*Brenchley, W. E.*—Weeds of Farm Land. (239 pp.). London: Longmans, Green & Co., 1920, 12s. 6d. net. [63.259(02).]

## Field Crops.

*Carter, H. R.*—Flax and its Products. (311 pp.). Technical Handbook No. 8. London: Bale & Danielsson, Gt. Titchfield St., 1920, 10s. 6d. net. [63.34111; 677.]

## Horticulture.

*Davis, K. C.*—Farm Life Text Series: Horticulture. (416 pp.). Philadelphia and London: J. B. Lippincott & Co., n.d., 8s. 6d. [63.5(02).]

*Gardeners' Chronicle.*—The Calendar of Garden Operations. (173 pp.). London: The Gardeners' Chronicle Offices, 1920, 2s. 6d. [63.5(02).]

*Seabrook, W. P.*—Modern Fruit Growing. (2nd Ed.), (176 pp.). Chelmsford: W. Seabrook & Sons, Ltd., 1919, 4s. 6d. net. [63.41(02).]

*Sears, F. C.*—Productive Small Fruit Culture. (Lippincott's Farm Manuals.) (368 pp.). Philadelphia and London: J. B. Lippincott & Co., 1920, 10s. 6d. [63.41(c).]

*Brown, Bliss S.*—Modern Fruit Marketing. (283 pp.). New York: Orange Judd Co., 1916. [63.41-198.]

*Andrea, A. L.*—Home Bottling, Drying and Preserving. (124 pp.). London: C. Arthur Pearson, Ltd., 1920, 2s. 6d. net. [664.85.]

*New South Wales, Department of Agriculture.*—Farmers' Bull. 130:—The Packing of Fruit. (46 pp.). Sydney, 1920. [63.41-198.]

*Wisconsin College of Agriculture.*—Circular 120:—Freezing Injuries to Potato Tubers. (4 pp.). 1919. [63.21; 63.512(04).]

## Plant Diseases.

*Fryer, P. J.*—Insect Pests and Fungus Diseases of Fruit and Hops. (728 pp.). London: Cambridge University Press, 1920, 45s. net. [63.24-41; 63.27-41; 63.294.]

*Western Australia, Department of Agriculture.*—Bull. 71:—Wheat Smuts and their Prevention, with Notes on Other Cereal Smuts and Ear Cockle. (44 pp.). Perth, 1920. [63.24-31.]

*Virginia Truck Experiment Station.*—Bull. 29:—Potato Spraying Experiments on the Control of the Pink and Green Aphid. (*Macrosiphum solanifolii*, Ashmead.) (17 pp.). Norfolk, 1919. [63.294; 63.512(04).]

## Live Stock.

*Dietrich, W.*—Swine: Breeding, Feeding and Management. (312 pp.). Chicago: Sanders Publishing Co., 1912. [63.645.]

*Davies, C. J.*—Goat-Keeping for Milk Production. (219 pp.). London: "Country Life" Offices, 1920, 10s. 6d. net. [63.83.]

*Wisconsin College of Agriculture.*—Circular 119:—Self-Feeders for Hogs. (15 pp.). 1919. [63.64.]

*Wisconsin College of Agriculture.*—Circular 121:—Pure-bred Bulls Pay. (16 pp.). 1920. [63.62.]

*U.S. Department of Agriculture.*—Circular 87:—Sweet-Clover-Seed Screenings not injurious to Sheep.—(7 pp.). Washington, 1920. [63.63.]

*U.S. Department of Agriculture.*—Farmers' Bull. 1090:—Rabbit Raising. (34 pp.). Washington, 1920. [63.69.]

**Veterinary Science.**

- U.S. Department of Agriculture.*—Farmers' Bull. 1085 :—Hog Lice and Hog Mange : Methods of Control and Eradication. (28 pp.) Washington, 1920. [63.64.]
- U.S. Department of Agriculture.*—Farmers' Bull. 1134 :—Castrating and Docking Lambs. (13 pp.). Washington, 1920. [619.09]; 63.63.]
- Storrs' Agricultural Experiment Station.*—Bull. 103 :—Infections Abortion in Cattle : Specific Measures of Control and Ultimate Eradication. (10 pp.). Connecticut, 1919. [619.2(a).]
- Pennsylvania Department of Agriculture.*—Gen. Bull. 323 :—Contagious Abortion of Cattle and the Uterine Douche Treatment. (18 pp.). Harrisburg, 1919. [619.2(a).]

**Dairying and Food, General.**

- Ireland, Department of Agriculture and Technical Instruction.*—Report of the Departmental Committee on the Decline of Dairying in Ireland. (31 pp.). H.M. Stationery Office, Dublin, 1920, 4d. net. [63.70(06).]
- Knight, E. G., Freear, K., and Williams, R. S.*—A Study of Factors concerned in the Production of Clean Milk. Part I. (8 pp.). London : P. S. King & Son, 1920, 1s. net. [614.32.]
- Wisconsin Agricultural Experiment Station.*—Bull. 315 :—Buttermilk Cheese and Cottage Cheese. (16 pp.). 1920. [63.73(04).]
- Purdue University Agricultural Experiment Station.*—Bull. 188 :—Cooling Cream on the Farm. (32 pp.). Lafayette, Ind., 1916. [63.713.]

**Birds, Poultry and Bees.**

- Gudnaux, G.*—Ornithologie Agricole. (396 pp.). Paris : J. B. Baillière et Fils. (Encyclopédie Agricole), 1920, 7fr. 50. [59.82.]
- North of Scotland College of Agriculture.*—Bull. 26 :—The Natural History of the Bee, *J. Anderson.* (28 pp.). Aberdeen, 1920. [63.81(04).]
- North of Scotland College of Agriculture.* Bull. 25 :—Some Hints for Prospective Bee-Keepers, *J. Anderson.* (8 pp.). Aberdeen, 1920. [63.81(04).]
- North of Scotland College of Agriculture.*—Bull. 27 :—How to Handle Bees, *J. Anderson.* (19 pp.). Aberdeen, 1920. [63.81(04).]

**Engineering.**

- Ontario Department of Agriculture.*—Bull. 277 :—Motor Transportation in Rural Ontario. (24 pp.). 1920. [388.]

**Economics.**

- Green, F. E.*—A History of the Agricultural Labourer, 1870—1920. (356 pp.). London : P. S. King & Son, 1920, 16s. net. [331.]
- Ditchfield, P. H.*—Old Village Life. (253 pp.). London : Methuen & Co., 1920, 7s. 6d. net. [333.5.]
- Saint-Léon, E. M.*—Syndicalisme Ouvrier et Syndicalisme Agricole. (160 pp.). Paris : Payot & Cie., 1920. [331.44].]
- Oxford University.*—Oxford Tracts on Economic Subjects. Sets I—IV. London : Oxford University Press, 1920, 10½d. per set. [33.]

## CONTENTS.

NOTES FOR THE MONTH	PAGE
<i>The Ministry's New Offices—Foot-and-Mouth Disease in the Midlands— Outbreaks of Rabies: The Duty of the Public—Journal Supplement on Official Seed Testing during 1919-20—Acreage and Live Stock Returns</i>	989
THE AGRICULTURE ACT, 1920	994
THE EMBARGO ON THE IMPORTATION OF CANADIAN STORE CATTLE: DEPUTATION TO THE MINISTER	999
FOOT-AND-MOUTH DISEASE: THE QUESTION OF INVASION	1004
THE MODERN COTTAGE OF CHALK AND CEMENT. <i>John F. Wilkes</i>	1010
PREVENTION OF "BUNT" IN WHEAT. <i>E. S. Salmon and H. Wormald</i>	1013
RECENT RESEARCH IN EGG PRODUCTION. <i>J. Hammond, M.A.</i>	1022
A SHELL FACTORY: FOR POULTRY	1033
PROFITABLE EGG PRODUCTION: HIGH PRODUCTIVITY ESSENTIAL	1035
SYNTHETIC NITROGENOUS FERTILISERS. <i>E. J. Russell, D.Sc., F.R.S.</i>	1037
PIT, TRENCH, AND OTHER IMPROVED SILOS. <i>A. W. Oldershaw, M.B.E., B.Sc.</i>	1046
RAT DESTRUCTION BY GOVERNMENT AID. <i>E. C. Read</i>	1052
IMPROVEMENT OF GRASS LAND: THE IMPORTANCE OF EXPERIMENTS. <i>T. J. Jenkin, M.Sc.</i>	1056
AGRICULTURE AS AN OCCUPATION FOR WOMEN. <i>Gertrude Watkin</i>	1060
MANURES FOR FEBRUARY. <i>E. J. Russell, D.Sc., F.R.S.</i>	1064
FEEDING STUFFS FOR JANUARY. <i>E. T. Halnan, M.A., Dip. Agric. (Camb.)</i>	1069
AGRICULTURE ABROAD:	
<i>Live Stock Exhibition in Argentina—Exports of Produce from Denmark— Wart Disease of Potatoes on the Continent</i>	1072
Silver Leaf Order of 1919	1077
Produce and Yield of Potato and Root Crops, 1920	1077
Corky Scab of Potatoes: Recent Investigation	1078
Foot-and-Mouth Disease	1080
Rabies	1081
Title Rentcharge: New Basis for Redemption	1081
English and Welsh Seed Potatoes: Importation into Scotland	1082
The Eggs (Distribution or Sale) Order, 1920	1082
Agricultural Training for Ex-Officers	1082
Notices of Books	1083
Leaflets issued by the Ministry	1084

*Any of the articles in this Journal may be reproduced in any registered newspaper or public periodical without special permission, provided that the source is acknowledged in each case.*

*The Ministry does not accept responsibility for the views expressed and the statements made by contributors, nor for any statements made in the advertisement columns of this Journal.*





BY APPOINTMENT.

# **FISON'S** IPSWICH **FERTILIZERS**

**"The Best in the World."**

The following among other awards  
have been obtained by their use :—  
Championship of the World for Barley  
Six Times—Brewers' Exhibition, London.

First Prize for Barley, Birmingham  
Fat Stock Show, 1920.

Gloucester County Cup, 1920.

Twenty-Guinea Cup for General Crop  
of Roots.

*Write for Illustrated Pamphlet and Prices.*

**JOSEPH FISON & CO., LD,**  
**IPSWICH.**

## **BETTER BREEDING RESULT** can be obtained by using **SHEEP AND LAM** **SHELTERING CLOTH**



**SPLENDID OPEN-AIR SHELTER**  
**INEXPENSIVE ——— LASTING**

*Made in two varieties, viz.:*

"SIMPLA" Windward Protection only  
(as illustrated).

"DUPLA" Windward & Overhead Shelter

*Write for Samples and Prices to:*

**J. RANDS & JECKEL**  
Dept. J. **IPSWICH**

*Manufacturers to H.M. The King.*

## **SILAGE is the Best and Cheapest** **Winter Food for Cattle.**

*If you wish to*  
**SAVE LABOUR**  
*grow Silage Crops instead*  
*of Roots, and*  
**ORDER YOUR SILO NOW.**

*Particulars and Prices of—*

**JEWSON & SONS, LTD.**

**TIMBER IMPORTERS AND CREOSOTERS.**  
**Head Office—NORWICH.**



